Nicholas A. Brown (CA Bar No. 198210)
Greenberg Traurig, LLP
101 Second St. Ste. 2200
San Francisco, CA 94105
Phone: (415) 655-1300
Fax: (415) 707-2010

Stephen M. Ullmer (CA Bar No. 277537)
Greenberg Traurig, LLP
1144 15th St. Ste. 3300
Denver, CO 80202
Phone: 303-685-6579
Fax: 303-572-6540

Attorneys for Plaintiff Tigo Energy Inc.

UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA

TIGO ENERGY INC.,

Plaintiff,

vs.

SUNSPEC ALLIANCE,

Defendant.

Case Number: 3:23-cv-00762-WHO

SECOND AMENDED COMPLAINT FOR PATENT INFRINGEMENT

DEMAND FOR JURY TRIAL

COMPLAINT

Plaintiff Tigo Energy, Inc. ("Tigo") brings this Second Amended Complaint for patent infringement against Defendant SunSpec Alliance ("SunSpec") and alleges as follows:

THE PARTIES

1. Tigo is a Delaware corporation, having its principal place of business at 655 Campbell Technology Pkwy., Campbell, CA 95008.

2. On information and belief and according to the records of the California Secretary of State website, SunSpec is a nonprofit corporation organized and existing under the laws of California with a principal place of business at 4040 Moorpark Avenue, Suite 110, San Jose, CA 95117.

JURISDICTION AND VENUE

3. This action arises under the patent laws of the United States, Title 35 of the United States Code. Accordingly, this Court has exclusive subject matter jurisdiction over this action under 28 U.S.C. §§ 1331 and 1338(a).

4. This Court has personal jurisdiction over SunSpec because, on information and belief, SunSpec maintains its principal place of business in this District and from that location conducts and directs the acts accused of infringement in this action.

5. Venue is proper in this District pursuant to 28 U.S.C. §§ 1391 and 1400(b) because, on information and belief, SunSpec regularly conducts business within this District, has a regular and established place of business in this District, and has committed acts of infringement within this District.

BACKGROUND

A. Solar Systems and Rapid-Shutdown

6. A typical roof-top solar system includes: (i) an array of photovoltaic modules (colloquially referred to as solar panels) that generate direct current (DC) from sunlight; (ii) an inverter that converts DC to alternating current (AC), which is the form of electricity used by the electrical grid and most homes; and (iii) wires and other components to connect the array of solar panels to the inverter. (*See* Exhibit 16 (www.energy.gov/eere/solar/how-does-solar-work); Exhibit 17 (www.energy.gov/eere/solar/solar-integration-inverters-and-grid-services-basics).)

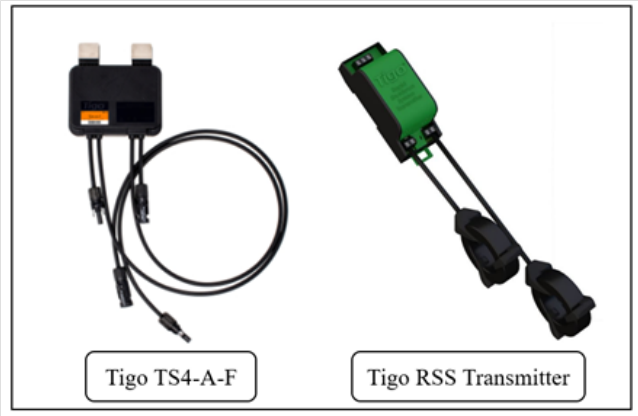
7. In the roof-top solar industry, "rapid shutdown" is safety feature that enables a solar

system to be shut down quickly at need, for example if firefighters need to access to the area where the solar system is installed, or if the power grid is off and it would be dangerous to supply it with power.

B. Tigo's Rapid-Shutdown Products

8. Tigo has been a leader for many years in developing technology for module-level rapid shutdown of photovoltaic panels.

9. Tigo's products include module-level rapid shutdown units that are attached to photovoltaic panels, such as its TS4-A-F product. The Tigo TS4-A-F works in conjunction with a transmitter, such as the Tigo RSS (Rapid Shutdown System) Transmitter, in order to provide a photovoltaic system that complies with the rapid-shutdown requirements of National Electric Code § 690.12. Tigo's TS4-A-F and RSS Transmitter rapid-shutdown products are pictured below:



10. Tigo has delivered more than 2 million rapid shutdown products to end users.

11. As a result of its pioneering work in developing technology for module-level rapid shutdown of photovoltaic panels, Tigo has obtained multiple patents related to module-level rapid shutdown.

C. Tigo's '321 Patent

12. U.S. Patent No. 8,933,321 ("'321 patent") is titled "Systems and methods for an enhanced watchdog in solar module installations," and was duly and legally issued by the United States Patent and Trademark Office on January 13, 2015.

13. Tigo is the owner and assignee of all substantial rights in the '321 patent, a copy of which is attached as Exhibit 1.

14. The '321 patent describes a system for "rendering a solar array safe during an emergency"

that involves a "watchdog unit" that "monitors a signal from a central controller" and shuts down solar modules if the signal "is lost, interrupted, or becomes irregular, or a shutdown signal is received." (Exhibit 1 at Abstract.)

15. Tigo's '321 patent issued from U.S. Patent Application No. from 12/628,977, which was filed in 2009 and was first published on June 10, 2010 as US 2010/0139734 A1.

D. National Electric Code Requirements For Rapid-Shutdown

16. In 2014, the National Electric Code added a new section, § 690.12 regarding "Rapid Shutdown of PV Systems on Buildings," which required that photovoltaic system circuits "installed on or in buildings shall include a rapid shutdown function." The 2014 version of the National Electric Code is often referred to as "NEC 2014."

17. In 2017, National Electric Code § 690.12 was amended. National Electric Code § 690.12 now specifies that the requires that photovoltaic system circuits "installed on or in buildings shall include a rapid shutdown function to reduce shock hazard for emergency responders." (emphasis added). National Electric Code § 690.12(B) further specifies that conductors more than 1 foot away from the photovoltaic array (i.e. the solar panels) "shall be limited to not more than 30 volts within 30 seconds of rapid shutdown initiation." The 2017 version of the National Electric Code is often referred to as "NEC 2017."

SUNSPEC AND ITS INFRINGEMENT OF TIGO'S '321 PATENT

A. SunSpec and SunSpec's Rapid-Shutdown Standard

18. SunSpec promotes itself as "the information standards and certification organization for the Distributed Energy Resource (DER) industry." (https://sunspec.org/mission/).

19. The mission of the SunSpec Alliance is to accelerate the growth of the Distributed Energy industry and expand the market for renewable power by specifying de facto standards – information models, data formats, communication protocols, system interfaces, best practices and other artifacts – that enable solar PV and energy storage Distributed Energy power plants to interoperate transparently. (https://sunspec.org/mission/).

20. SunSpec's members include SMA Solar Technology AG ("SMA"), Zhejiang Jiaming Tianheyuan Photovoltaic Technology Co., Ltd. ("JMTHY"), MidNite Solar, Inc. ("MidNite"), and Zerun Co., Ltd. ("Zerun"). (https://sunspec.org/members/).

21. SunSpec has published specifications concerning rapid shutdown technology, including the August 21, 2017 Communication Signal for Rapid Shutdown SunSpec Interoperability Specification, Approved Version 34 (Exhibit 2, hereinafter the "Interoperability Specification"), and the March 9, 2021 Communication Signal for Rapid Shutdown Test Specification, Version 18 (Exhibit 3, hereinafter the "Test Specification").

22. The Interoperability Specification incorporates the Test Specification. (Exhibit 2 at 23.) The two documents collectively are referred to hereinafter as "the SunSpec RSD Specifications."

23. The SunSpec RSD Specifications are designed so that all solar systems that comply with their requirements meet the rapid shutdown requirements of National Electric Code § 690.12. (Exhibit 2 at 11 ("The SunSpec Communication Signal for Rapid Shutdown Specification is designed to support rapid shutdown requirements of any PV system governed by NEC 2014, NEC 2017, or applicable UL standard(s)"; Exhibit 2 at 24 (explaining that in NEC 2014 and NEC 2017 "section 690.12 includes Rapid Shutdown requirements"); Exhibit 2 at 1 ("This document defines a multi-vendor, multi-device (e.g. inverter, module, string combiner) communication interoperability specification to support NEC 2014, NEC 2017 and UL 1741 module-level rapid shutdown requirements."); Exhibit 2 at 10.)

24. On information and belief, SunSpec developed and publishes the SunSpec RSD Specifications with the intent that they be used: that members of the public—including solar system installers, solar system customers, and SunSpec members—will install and use solar systems that comply with the SunSpec RSD Specifications.

25. Figure 1 of the Interoperability Specification is titled "Rapid Shutdown System" and is reproduced below with color added. The transmitter (green) is located with the inverter, and receivers (blue) are located with the solar panels (purple). Each receiver shuts down its solar panel unless it receives a permission-to-operate signal from the transmitter.

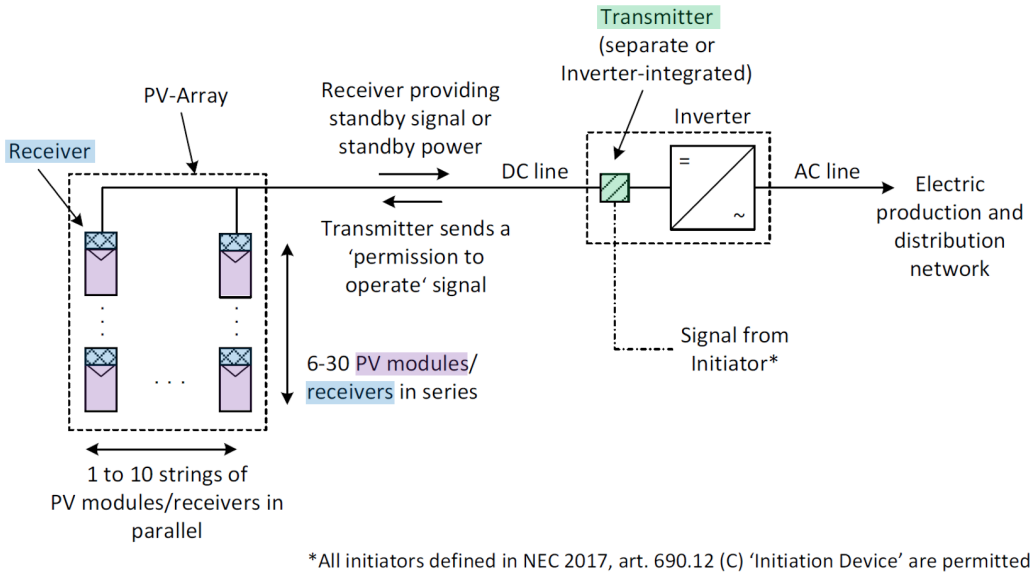


Figure 1: Rapid Shutdown System

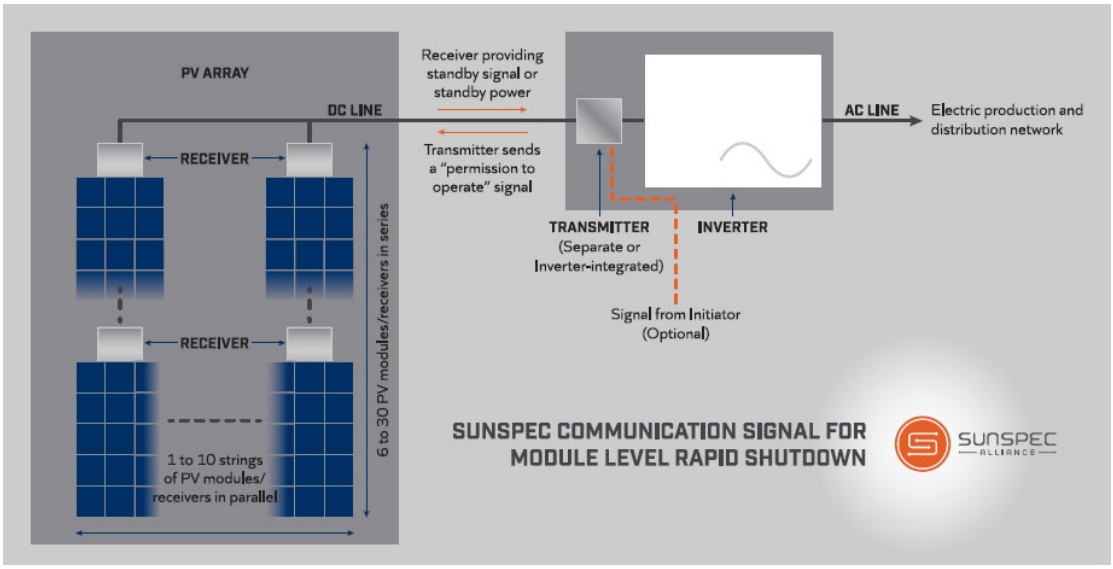
(Exhibit 2 at 11.)

26. As shown in Figure 1, solar systems that comply with the SunSpec RSD Specifications include solar modules ("PV modules").

27. SunSpec publishes a "Rapid Shutdown Fact Sheet," attached as Exhibit 18, at the URL https://sunspec.org/wp-content/uploads/2021/12/SunSpec-RapidShutdown-FactSheet-20200507.pdf.

28. On information and belief, SunSpec's Rapid Shutdown Fact Sheet was published on May 7, 2020.

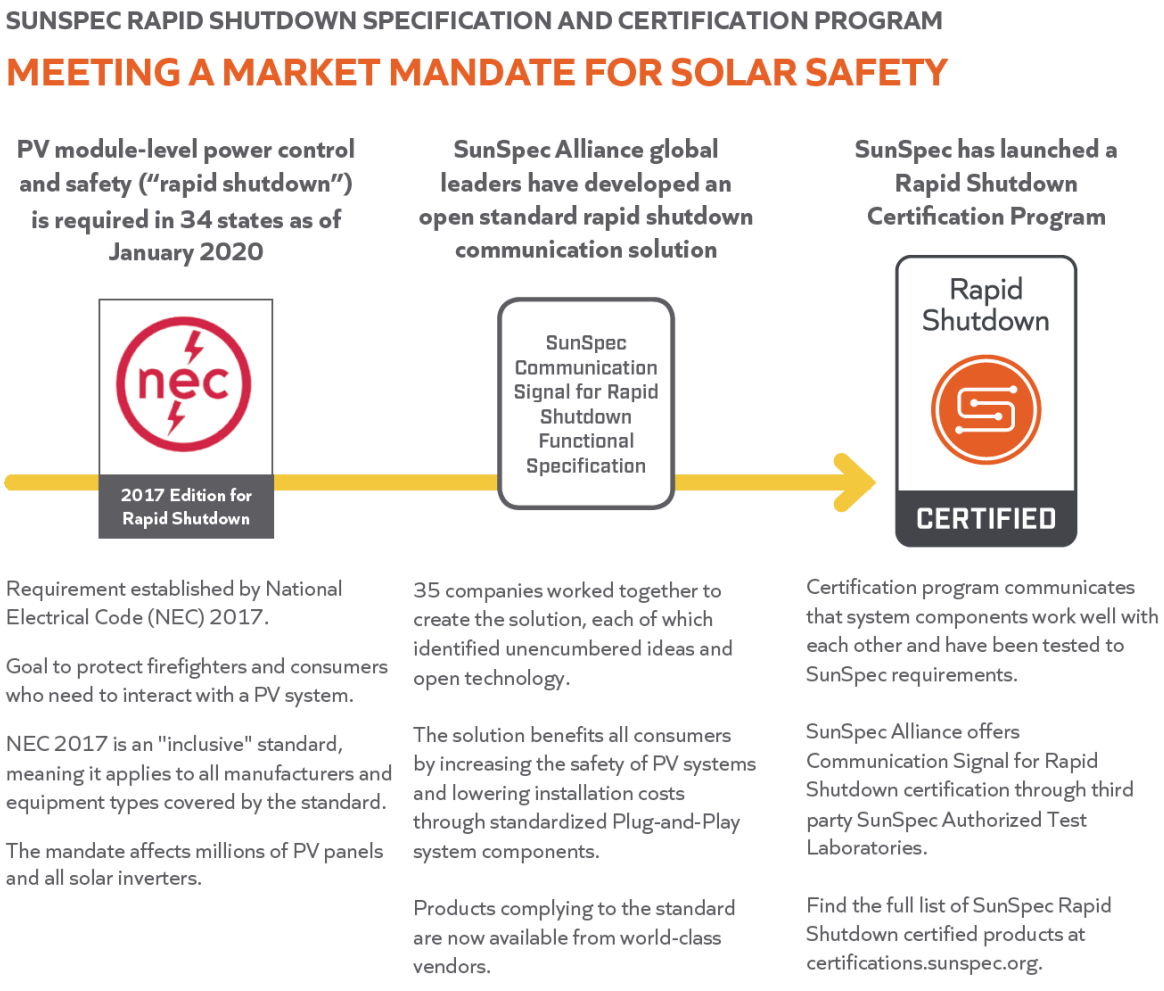
29. SunSpec's Rapid Shutdown Fact Sheet contains a figure that is substantially identical to Figure 1 of the Interoperability Specification, except that it uses different graphics:



(Exhibit 18 at 2.)

30. SunSpec's Rapid Shutdown Fact Sheet is subtitled "SunSpec Rapid Shutdown Specification and Certification Program." It explains that "PV module-level power control and safety ('rapid shutdown') is required in 34 states as of January 2020" due to requirements "established by National Electrical Code (NEC) 2017" in order to "protect firefighters and consumers who need to interact with a PV system." (Exhibit 18 at 1.)

31. SunSpec's Rapid Shutdown Fact Sheet states that SunSpec "developed an open standard rapid shutdown communication solution" in order to benefit "all consumers by increasing the safety of PV systems and lowering installation costs." It also states that "Products complying to the standard are now available from world-class vendors" and "Find the full list of SunSpec Rapid Shutdown certified products at certifications.sunspec.org:"



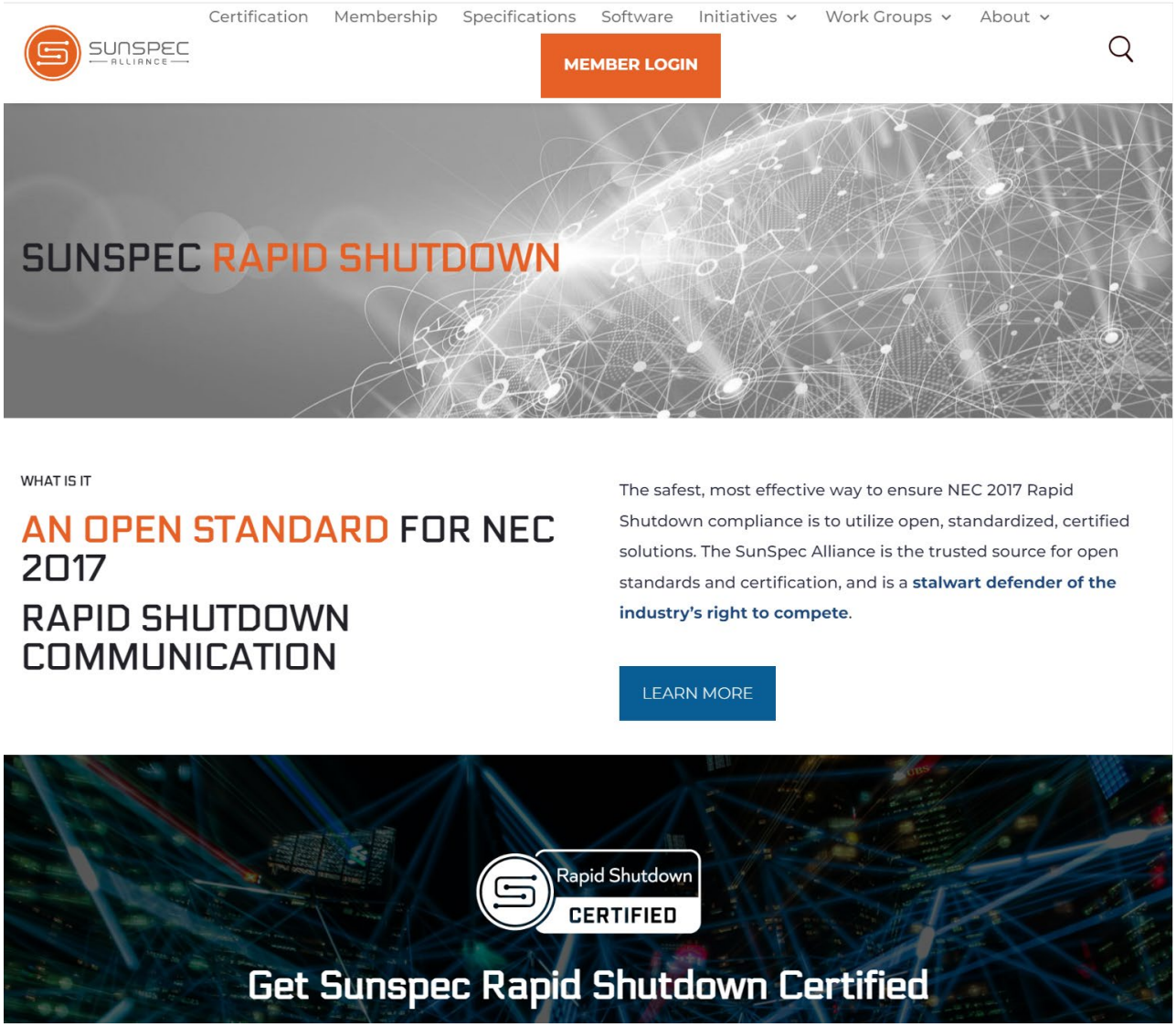
(Exhibit 18 at 1.)

32. On information and belief, SunSpec publishes the Rapid Shutdown Fact Sheet to induce members of the public—including solar system installers, solar system customers, and SunSpec members—to purchase and install solar systems that comply with the SunSpec RSD Specifications. Such systems include solar modules as shown in the figure in the Rapid Shutdown Fact Sheet.

33. The SunSpec Rapid Shutdown certified products identified at the URL identified in the Rapid Shutdown Fact Sheet (certifications.sunspec.org) include: Fronius Symo Advanced (includes SunSpec Rapid Shutdown Transmitter) (certification RS-000001), SMA Sunny Boy US (includes SunSpec Rapid Shutdown Transmitter) (certification RS-000002), SMA Sunny Tripower CORE1 (includes SunSpec Rapid Shutdown Transmitter) (certification RS-000003), SMA TS4-R-F-42 (certification RS-000004), Zerun PV Rapid Shutdown Equipment (certification RS-000007), Ginlong Technologies Co., Ltd. Solis Module Level Rapid Shutdown System Transmitter Equipment (certification RS-000008), Zhejiang Jiaming Tianheyuan Photovoltaic Technology Co Ltd (JMTHY) Rapid Shutdown Box (certification RS-000009), Fronius Primo GEN24 (includes SunSpec Rapid Shutdown Transmitter) (certification RS-000010), Canadian Solar Inc. PV RSD System Eq. (includes SunSpec Rapid Shutdown Transmitter) (certification RS-000011), Northern Electric Power Technology, Inc. photovoltaic rapid shutdown system equipment (includes SunSpec Rapid Shutdown Transmitter) (certification RS-000013), Enteligent Inc. PV Rapid Shutdown Equipment (certification RS-000014), Zhejiang Benyi Electrical Co., Ltd. Photovoltaic Rapid Shutdown Equipment (certification RS-000015), Hoymiles Power Electronics Inc. HRSD (certification RS-000016), Hoymiles Power Electronics Inc. Transmitter and Transmitter Plus (certification RS-000017), SMA Sunny Tripower X (includes SunSpec Rapid Shutdown Transmitter) (certification RS-000018).

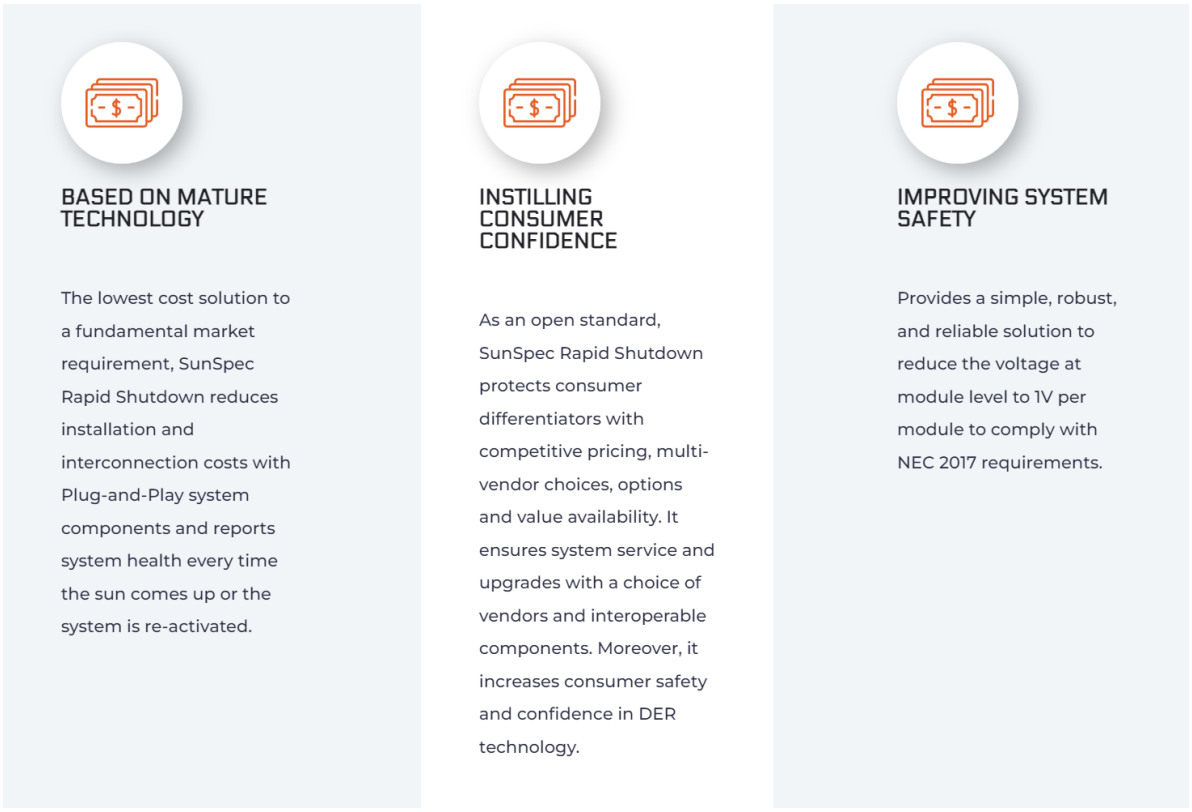
34. SunSpec owns and controls the website sunspec.org.

35. On information and belief, SunSpec publishes pages on its website to promote the SunSpec RSD Specifications and to induce the public to install and use solar systems that comply with the SunSpec RSD Specifications. For example:



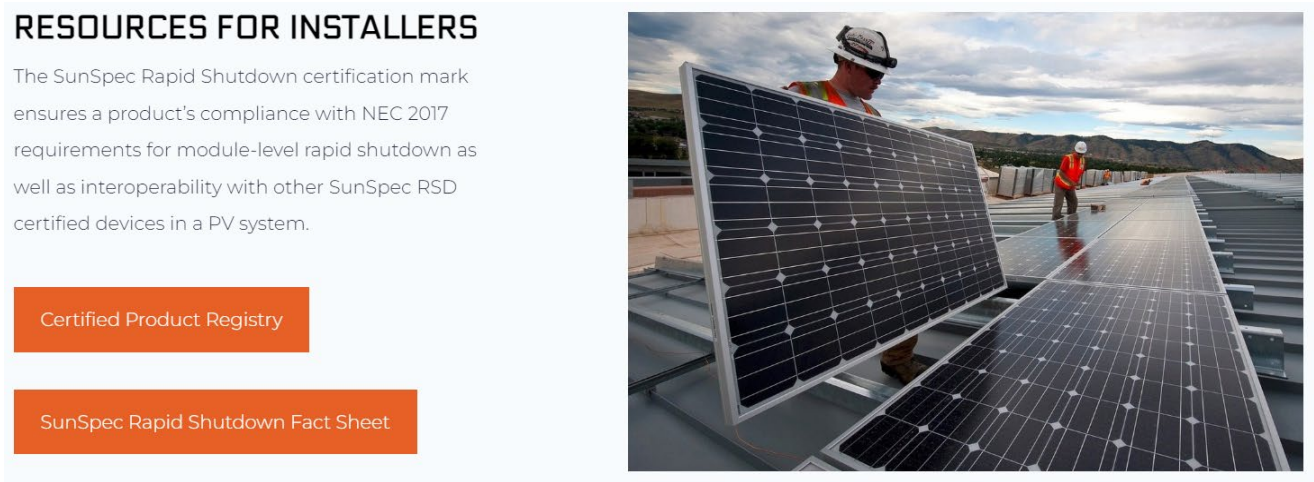
(https://sunspec.org/sunspec-rapid-shutdown-initiative/). On this page, SunSpec tells the public that the "safest, most effective way to ensure NEC 2017 Rapid Shutdown compliance" is to use the open standard that SunSpec publishes: "SunSpec Rapid Shutdown."

36. The SunSpec website promotes the benefits to installers and end-users of solar systems that comply with the SunSpec RSD Specifications:



(https://sunspec.org/sunspec-rapid-shutdown-initiative/). For example, SunSpec tells the public on this page that its standard provides the "lowest cost solution to a fundamental market requirement" and "increases consumer safety." Similarly, SunSpec tells the public that its standard "reduces installation and interconnection costs."

37. The same SunSpec website page includes a section entitled "Resources For Installers" that includes a picture of solar panels being installed and provides links to (i) the SunSpec Rapid Shutdown Fact Sheet (Exhibit 18) and (ii) SunSpec's "Certified Product Registry:"



(https://sunspec.org/sunspec-rapid-shutdown-initiative/).

B. All Solar Systems That Use SunSpec's Rapid Shutdown Standard Infringe Tigo's '321 Patent

38. Tigo's work in the area of module-level rapid shutdown of photovoltaic panels far pre-dates both the rapid-shutdown requirements of National Electric Code § 690.12 and SunSpec's work on rapid-shutdown.

39. Tigo's '321 patent issued from U.S. Patent Application No. from 12/628,977, which was filed in 2009 and was first published on June 10, 2010 as US 2010/0139734 A1. National Electric Code § 690.12 was introduced in 2014. SunSpec's Interoperability Standard identifies September 2, 2015 as the date of its "First Draft."

40. On information and belief, SunSpec copied Tigo's product line and Tigo's patented technology in developing the SunSpec RSD Specifications.

41. All solar systems that comply with the SunSpec RSD Specifications infringe claims 1, 12, and 13 of Tigo's '321 patent.

42. Claim 1 of the '321 patent recites:

A system comprising:

a watchdog unit coupled between a solar module and a power bus, the power bus configured to connect a plurality of solar modules to an inverter, the watchdog unit having:

a local controller configured to monitor a communication from a central controller remote from the solar module and determine whether the communication has been interrupted for a time period longer than a predetermined number of allowed skips; and

at least one switch configured to disconnect the solar module from the power bus in response to a determination by the location controller that the communication from the central controller has been interrupted for a time period longer than the predetermined number of allowed skips;

wherein the watchdog unit is configured to connect the solar module to the power bus when the communication is not interrupted.

43. Claims 12 and 13 of the '321 patent recite:

12. A system comprising:

a watchdog device coupled between a solar module and a power bus, the power bus configured to connect a plurality of solar modules to an inverter, the watchdog device configured to:

verify communication with a central controller remote from the solar module; and

shutdown the solar module from the power bus if communication with the central controller cannot be verified for a time period longer than a predetermined number of allowed skips.

13. The system of claim 12, wherein to shutdown the solar module entails disconnecting the solar module from the power bus.

44. All solar systems that comply with the SunSpec RSD Specifications are systems in which a watchdog unit (a "receiver" in Figure 1 of the Interoperability Specification, below) is coupled between a solar module (one of the "6-30 PV modules . . . in series" in the figure below) and a power bus (the "DC line" in the figure below). The power bus is configured to connect a plurality of solar modules (two or more of the "6-30 PV modules . . . in series" in the figure below) to an inverter and a transmitter, which may be separate from or integrated in an inverter. As described below, each receiver (blue) shuts down its solar panel (purple) unless it receives a permission-to-operate signal from the transmitter (green).

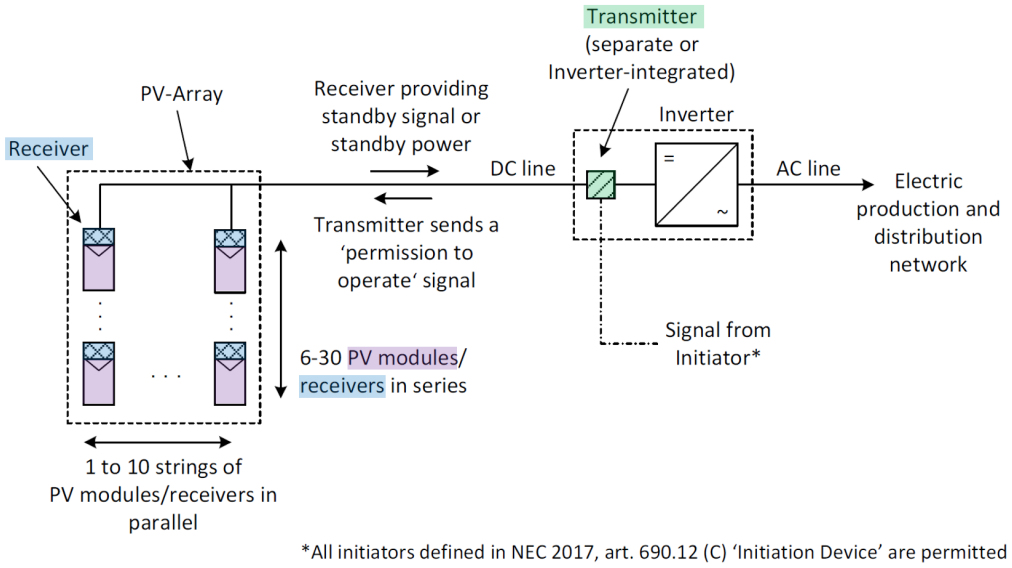


Figure 1: Rapid Shutdown System

(Exhibit 2 at 11.)

45. The SunSpec RSD Specifications are designed so that all solar systems that comply with their requirements meet the rapid shutdown requirements of National Electric Code § 690.12. The SunSpec Interoperability Specification defines a "Rapid Shutdown System" as "a collection of Components and Communication Protocols that are used to fulfill rapid shutdown requirements as defined by NEC 2014 or NEC 2017." (Exhibit 2 at 11.) As stated above, National Electric Code § 690.12 was introduced in NEC 2014 and amended in NEC 2017. (*See* Exhibit 2 at 24.) National Electric Code § 690.12 is entitled "Rapid Shutdown of PV Systems on Buildings" and requires that electrical conductors

that are more than 1 foot away from a photovoltaic array (i.e. a set of solar panels) be limited to "not more than 30 volts within 30 seconds of rapid shutdown initiation.""

46. The SunSpec RSD Specifications define requirements for the "transmitter" and "receivers" in the solar system shown in Figure 1 above.

> **Transmitter**
> A Transmitter is the equipment that is responsible for sending a communication signal that reflects the current state of the Initiator. The portion of the PV system controlled by a single Transmitter is referred to as a Sub-system. The minimum and maximum size of a Sub-system supported by a single Transmitter is manufacturer-dependent and must be specified by the manufacturer.
>
> **3.1.2 Requirement: A System must have at least one Transmitter.**
>
> **3.1.3 Requirement: A Sub-system must have only one Transmitter.**
>
> **3.1.4 Requirement: A Transmitter must comply with the minimum output voltage and minimum output source impedance specified in** Table 1 Mode Transition Parameters**.**
>
> **Receiver**
>
> A Receiver is the equipment that is responsible for accepting the communication signal sent by a Transmitter and is capable of initiating a state change of PV power source components based on the signal received.
>
> **3.1.5 Requirement: A Sub-system must have at least one Receiver.**
>
> **Transmitter/Receiver Interactions**
>
> Transmitter/Receiver interactions are at the heart of Communication Signal for Rapid Shutdown operation. By optimizing for efficiency and simplicity, low-cost and reliable system solutions are possible.
>
> **3.1.6 Requirement: A Transmitter must transmit a permission to operate signal to Receivers when the Initiator indicates rapid shutdown is not active.**
>
> **3.1.7 Requirement: A Transmitter must stop transmitting a permission to operate signal to Receivers when the Initiator indicates rapid shutdown is active.**
>
> **3.1.8 Requirement: A Receiver must be able to receive a permission to operate signal and initiate the ability of the associated power-producing equipment to produce power.**
>
> **3.1.9 Requirement: A Receiver must detect the absence of a permission to operate signal and initiate the shutdown of power production by associated power producing equipment.**

(Exhibit 2 at 11-12.)

47. The SunSpec RSD Specifications further require that "Rapid Shutdown Systems" (shown in Figure 1 above) "must provide a mechanism to bring the PV system(s) back online after a rapid shutdown event."

> **3.2.1 Requirement: Rapid Shutdown Systems must provide a mechanism to bring the PV system(s) back online after a rapid shutdown event.**

(Exhibit 2 at 13.)

48. The SunSpec Interoperability Specification states that "Two modes of operation are defined for a Rapid Shutdown System: Active Mode and Shutdown Mode." (Exhibit 2 at 13.)

49. The SunSpec Interoperability Specification states that "Active Mode is characterized by the typical state of a PV system, generating power unimpeded by the Rapid Shutdown System." (Exhibit 2 at 13.) "No specifications or restrictions are placed on PV generators during the Active (power producing) Mode." (Exhibit 2 at 13.) "The Transmitter continuously transmits a 'permission to operate' bit sequence to indicate PV Power Sources have permission to operate in the Active Mode. If the Transmitter ceases to transmit the permission to operate sequence then the Subsystem enters the Shutdown Mode." (Exhibit 2 at 16.)

50. For "Shutdown Mode," the SunSpec Interoperability Specification states that "NEC 2017 specifications require the illuminated PV generators and complete PV system to be de-energized to a maximum when in the Shutdown Mode." (Exhibit 2 at 13.) It requires that "When in shutdown mode, the receiver shall provide a standby signal to indicate the presence of irradiance", i.e. an "illuminated PV generator." (Exhibit 2 at 14 (emphasis added).) Thus, the SunSpec Interoperability Specification includes requirements for the "output power of the PV system" and "each PV generator:"

> **4.3.1 Requirement: The output power of the PV system in Shutdown Mode must stay below the maximum voltage specifications stated per NEC 2017.**
>
> **4.3.2 Requirement: The minimum current available in the shutdown state must be sufficient to guarantee operation of equipment monitoring the state of the modules as specified in** Table 1 Mode Transition Parameters**.**
>
> **4.3.3 Requirement: When in the Shutdown state, each PV generator must provide output voltage V_{OFF}, with minimum current I_{OFF} as defined in** Table 1 Mode Transition Parameters**.**

(Exhibit 2 at 14.)

51. All solar systems that comply with the SunSpec RSD Specifications are systems in which a receiver with a local controller is configured to monitor a communication (the SunSpec signal referred to as "permission to operate" or "KeepAlive") from a central controller that is remote from the solar module (the transmitter in Figure 1 above) and determine whether the communication has been interrupted for a time period longer than a predetermined number of allowed skips:

4.5 Mode Transition Parameters

The following values and parameter ranges are **Requirements** of the Mode Transition attributes of this specification.

Symbol	Mode Specification	Min.	Max.	Unit	Remark
V_{OFF}	PV Power Source voltage in Shutdown	0.6	NA	V	Accommodates % or fixed methods
I_{OFF}	Output current for V_{OFF} tolerance window	10	NA	mA	Requirement
I_{OFFHI}	Output current for V_{OFF} tolerance window for high power option	400	NA	mA	Option
TT1	Time for Initiator to relay to Transmitter	NA	2	s	
TT2	Time for Transmitter to stop permission to operate signal	NA	2	s	
TT3	Time for Receiver to de-energize PV Power Sources	NA	13	s	
TT4	Time for Inverter stored charge to be eliminated	NA	13	s	
TT5	Total time to complete TT1+TT2+TT3+TT4	NA	30	s	
TR1	Time for Receivers to enable PV power generation after compliant KeepAlive signaling commences at the output of the Transmitter.	NA	20	s	Under all expected operating conditions.

Table 1 Mode Transition Parameters

(Exhibit 2 at 15.)

5.3 PLC Protocol Requirements

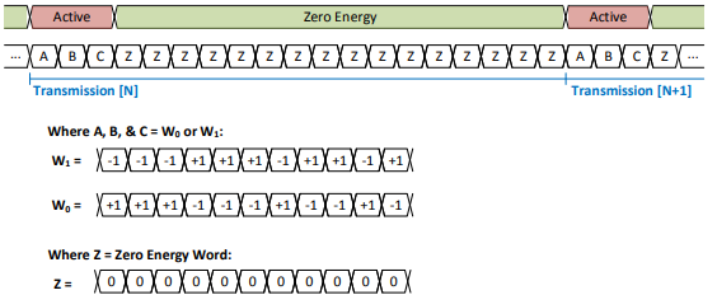


Figure 5: Keep Alive Duty Cycle Timing Diagram

The following values and parameter ranges are **Requirements of the Power Line Communication** attributes of this specification.

(Exhibit 2 at 21.)

Symbol	Transmitter Specification	Min.	Nom.	Max.	Unit	Remark
W_1	Logic 1 Code Word	{{-1, -1, -1, +1, +1, +1, -1, +1, +1, -1, +1}				+1 = mark, -1=space
W_0	Logic 0 Code Word	{+1, +1, +1, -1, -1, -1, +1, -1, -1, +1, -1}				+1 = mark, -1=space
Z	Zero Energy Word	{0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0}				0 = zero energy
	Cyclical Transmission	{A, B, C, Z, Z, Z, Z, Z, Z, Z, Z, Z, Z, Z, Z, Z}				A,B,C are W_0 or W_1 Z=zero energy word
	Permission To Operate Code	A B C = W_1 W_1 W_1				Mandatory
	Accelerated Shutdown	A B C = W_0 W_0 W_0				Optional
	Proprietary Use 1 Includes permission to operate	A B C = W_1 W_0 W_1				Optional
	Proprietary Use 2 Without permission to operate	A B C = W_0 W_1 W_0				Optional
	Reserved Includes permission to operate	ABC = W_1 W_1 W_0				Do not use
	Reserved Without permission to operate	ABC = W_0 W_0 W_1				Do not use
	Reserved Without permission to operate	ABC = W_0 W_1 W_1				Do not use
	Reserved Without permission to operate	ABC = W_1 W_0 W_0				Do not use
F_M	Mark Frequency	131.236875	131.25	131.263125	kHz	6.25kHz × 21
F_S	Space Frequency	143.735625	143.75	143.764375	kHz	6.25kHz × 23
T_S	Average Bit Period	5.119488	5.12	5.120512	ms	(Time to complete one full duty cycle)/219
T_T	Transmission Period	168.943104	168.96	168.976896	ms	3 Words
T_Q	Quiet Period	901.029888	901.12	901.210112	ms	16 Words
T_C	Cycle Period	1069.972992	1070.08	1070.187008	ms	19 Words
Z_{TX}	Transmitter Output Impedance	0.05		1.5	Ω	

V_{TX}	Transmitter Output Voltage into >100 kΩ	0.9	1.0	1.1	V r.m.s.	
V_{RXMAX}	Receiver Input Voltage Max	142			mV r.m.s.	
$V_{RXSENSE}$	Receiver Input Voltage Minimum Sensitivity			1.20	mV r.m.s.	118:1 dynamic range
Z_{RXS}	Receiver Line Impedance @ F_S	0.7		1.5	Ω	
Z_{RXM}	Receiver Line Impedance @ F_M	0.7		1.5	Ω	
P_{FALSE}	Probability of false detection					Per SunSpec testing

Table 6 Power Line Communication Values

Table Footnotes:

1. Sequences shall be transmitted in left-to-right order {b1, b2, b3… } means bit 1 followed by bit 2, followed by bit 3 etc.
2. Code words are transmitted continuously in a repetitive, cyclical fashion with no extraneous signaling bits nor additional time delay inserted between them.
3. Code sequences without permission to operate can be sent during a Rapid shutdown initiation while code sequences with permission to operate shall only be sent when an initiator indicates rapid shutdown is not active. If there is no functional indication to use any other code sequence with permission to operate, the code sequence A B C = W_1 W_1 W_1 must be used.
4. Reserved code sequences are for future use by this standard.
5. Receiving a code sequence without permission to operate is not an accelerated shutdown and should be treated like there was no permission to operate signal received.
6. All frequencies and durations are subject to ±100 ppm tolerances on their nominal values at the transmitter.
7. Receivers shall perform within SunSpec specification limits for any long-term frequency deviations at the transmitter that lie within the allowable ±100 ppm tolerance.
8. Receivers may assume that transmitted bit rate and Mark/Space tone frequencies are correlated (*i.e.*, derived from the same original clock source).
9. The receiver line impedance for the mark and space frequency is defined at the input terminals of the device, without the attached wiring under all operating conditions of the device. The specified sensitivity refers to this specified receiver line impedance.

(Exhibit 2 at 22-23.)

3.2.2.Receiver in-band interferer rejection

The test shall be performed according to figure 3.1 (or 3.2 for multi-module RSDs). The interfering signal is a CW tone sent with a varying frequency between 120kHz and 155kHz according to table 3.2 and Figure 3.4.

It has to be noted that CW blockers at FM and FS are included in this test. The goal is to test that the architecture of the receiver is immune to any single tone blocking signal right at FS or FM.

(Exhibit 3 at 12; *see also* Exhibit 3 at 12-13 ("Test-1: ON-state, the RSD must stay ON in the presence of interferer"); Exhibit 2 at 19 ("Requirement: Receiver(s) must indicate the absence of permission to operate signals without any false alarms over at least one hundred (100) hours observation period in the presence of a standardized noise and interference test signal as specified in the SunSpec Rapid Shutdown Compatibility Test Plan"); Exhibit 2 at 13 ("NEC 2017 specifications require the illuminated PV generators and complete PV system to be de-energized to a maximum when in the Shutdown Mode. Instead of completely zeroing output power capability, the receiver must provide a non-zero output voltage and current within the range offered as allowable by NEC 2017.").

52. As shown above, the cycle period for the permission-to-operate signal is 1.07 seconds, and

the time for the receiver to de-energize its PV power sources is 13 seconds. This shows that the SunSpec RSD Specifications use a time period longer than a predetermined number of allowed skips of the permission-to-operate signal. This is also shown by the requirements that the receiver be immune to any single tone blocking signal and that it operate without any false alarms.

53. All solar systems that comply with the SunSpec RSD Specifications include a watchdog unit with a local controller (the receiver in Figure 1 above) that includes at least one switch configured to disconnect a solar module from the power bus in response to a determination by the local controller that the communication (permission-to-operate signal) from the central controller (transmitter in Figure 1 above) has been interrupted for a time period longer than the predetermined number of allowed skips:

Receiver	The equipment that is responsible for accepting the communication signal sent by a Transmitter and is capable of initiating a state change of PV power source components based on the signal received. (see Section 3.1 of this document)

(Exhibit 2 at 9; *see also* Exhibit 2 at 15, 21-23 (reproduced above).)

Receiver

A Receiver is the equipment that is responsible for accepting the communication signal sent by a Transmitter and is capable of initiating a state change of PV power source components based on the signal received.

3.1.5 Requirement: A Sub-system must have at least one Receiver.

Transmitter/Receiver Interactions

Transmitter/Receiver interactions are at the heart of Communication Signal for Rapid Shutdown operation. By optimizing for efficiency and simplicity, low-cost and reliable system solutions are possible.

3.1.6 Requirement: A Transmitter must transmit a permission to operate signal to Receivers when the Initiator indicates rapid shutdown is not active.

3.1.7 Requirement: A Transmitter must stop transmitting a permission to operate signal to Receivers when the Initiator indicates rapid shutdown is active.

3.1.8 Requirement: A Receiver must be able to receive a permission to operate signal and initiate the ability of the associated power-producing equipment to produce power.

3.1.9 Requirement: A Receiver must detect the absence of a permission to operate signal and initiate the shutdown of power production by associated power producing equipment.

(Exhibit 2 at 12.)

54. All solar systems that comply with the SunSpec RSD Specifications include a watchdog unit ("receiver" in Figure 1 above) that is configured to connect a solar module ("PV module" in Figure 1

above) to the power bus when the communication (permission to operate signal) is not interrupted. This is shown in the excerpts from Exhibit 2 and Exhibit 3 cited above, including specifically the excerpts describing the "permission to operate" signal and the "Active Mode" of the "Rapid Shutdown System." (*See also* Exhibit 3 at 12-13 ("Test-1: ON-state, the RSD must stay ON in the presence of interferer"); Exhibit 2 at 13 (stating that "Rapid Shutdown Systems" (shown in Figure 1 above) "must provide a mechanism to bring the PV system(s) back online after a rapid shutdown event."))

C. SunSpec Knows That All Solar Systems That Use Its Rapid Shutdown Standard Infringe Tigo's '321 Patent

55. Tigo formally notified SunSpec in October 2017 that Tigo owned the '321 patent and that at least claims 1 and 12 of the '321 patent are necessary to the SunSpec RSD Specifications.

56. On or about November 1, 2017, SunSpec publicly acknowledged Tigo's notice that claims 1 and 12 of the '321 patent are "necessary" to the SunSpec RSD Specifications in a "Member's Briefing." SunSpec publicly repeated that acknowledgment by posting the slides from that meeting on its website at http://sunspec.org/wp-content/uploads/2019/08/RapidShutdown IPbriefing20171101.pdf. A copy of the "Member's Briefing" slides is attached as Exhibit 4.

57. SunSpec knew that Tigo's notice that claims 1 and 12 of the '321 patent are "necessary" to the SunSpec RSD Specifications meant that Tigo was giving notice that any solar system that uses the SunSpec RSD Specifications infringes claims 1 and 12 of the '321 patent.

58. On February 14, 2020, Tigo's attorneys sent SunSpec a letter, explaining that Tigo was willing to license its patents related to rapid-shutdown technology (including the '321 patent) to SunSpec's members on reasonable and nondiscriminatory terms. A copy of the letter is attached as Exhibit 5.

59. Instead of encouraging or facilitating conversations between its members and Tigo, SunSpec published a "prior art synopsis," including at least at the URL https://sunspec.org/wp-content/uploads/2021/02/SunSpec-Rapid-Shutdown-Prior-Art-Synopsis-2021.pdf. SunSpec's "prior art synopsis" document states that its "purpose" is to establish that the technologies involved in the SunSpec RSD Specifications were "invented or discovered years or even decades ago and are in the public domain." A copy of SunSpec's "prior art synopsis" document is attached as Exhibit 6.

60. On information and belief, by publishing and distributing Exhibit 6 SunSpec intended to induce members of the public, including SunSpec members, to infringe Tigo's '321 patent by suggesting that prior art would render Tigo's claims invalid or otherwise unenforceable.

61. In 2020, when Tigo learned that a SunSpec member was importing and selling a product certified under SunSpec's rapid-shutdown standard, Tigo filed a complaint in this district to enforce its '321 patent: *Tigo Energy Inc. v. Altenergy Power Systems Inc. et al.,* No. 5:20-cv-03622 (N.D. Cal.). SunSpec knew of this lawsuit and its basis.

62. After signing a license agreement with APsystems and dismissing the lawsuit identified above, Tigo formally notified SunSpec in a letter dated May 20, 2021 that it was inducing infringement of the '321 patent by encouraging its members to import, make, use, sell, or offer to sell products that comply with the SunSpec RSD Specifications in the United States without a license to the '321 patent. A copy of the letter is attached as Exhibit 7.

63. Tigo's 2021 letter (Exhibit 7) informed SunSpec that Tigo was willing to license the '321 patent to SunSpec members, and that Tigo would be willing to resolve the matter of SunSpec's infringement amicably if SunSpec would notify its members that they need a license from Tigo to import, make, use, sell, or offer to sell rapid shutdown devices that adhere the SunSpec RSD Specifications.

64. On or about June 21, 2021, Tigo again notified SunSpec that it was inducing infringement of Tigo's '321 patent by encouraging use of the SunSpec RSD Specifications without a license. A copy of the letter is attached as Exhibit 8.

65. SunSpec again declined to either acknowledge that a license from Tigo was needed to comply with SunSpec RSD Specifications or encourage its members to obtain a license from Tigo. Instead, in July 2021 SunSpec filed an *inter partes* review ("IPR") proceeding with the Patent Trial and Appeal Board (the "Board") of the United States Patent and Trademark Office (IPR2021-01286) in an effort to invalidate claims of the '321 patent that are necessary to the SunSpec RSD Specifications.

66. On information and belief, SunSpec's effort to invalidate the '321 patent was funded at least in part by SunSpec members, including SMA Solar Technology AG.

67. Sunspec's IPR against the '321 patent listed several of its members, including SMA, as "Real Parties-in-Interest" to the proceeding.

68. After the IPR was instituted, but long before it was decided, SunSpec issued a press release dated February 15, 2022 and posted the press release on its website at https://sunspec.org/inter-partes-review/. A copy of the press release is attached as Exhibit 9. The press release contends that Tigo's '321 patent is invalid and lauds the Patent Office for instituting SunSpec's IPR petition against the '321 patent. The press release states that "SunSpec strongly disagrees with Tigo that any products practicing the Rapid Shutdown Specification infringe any valid Tigo patents" and that it filed the IPR in order to support its position.

69. On January 26, 2023, the Patent Office issued a Final Written Decision in SunSpec's IPR. The Final Written Decision is attached as Exhibit 10. The Final Written Decision rejected SunSpec's invalidity positions, holding that none of the claims that SunSpec challenged in Tigo '321 patent were unpatentable.

70. Notwithstanding this decision, on or about January 30, 2023, SunSpec issued a press release titled "Patent Office Invalidates Tigo Energy, Inc.'s Patent Claims" (see https://sunspec.org/patent-office-invalidates-tigo-energy-inc-s-patent-claims/). A copy of this press release is attached as Exhibit 11.

71. Near the end of the January 30, 2023 press release, SunSpec acknowledged that the Patent Office decided not to invalidate "certain other challenged claims of the … '321 patent":

> The Patent Office ultimately declined to cancel certain other challenged claims of the '770 and '321 patents in its decisions today. SunSpec is still considering its options with respect to these claims, including the possibility of appealing the decisions on those claims.

(Exhibit 11.)

72. However, SunSpec failed to acknowledge that the Patent Office decided not to invalidate any claims in SunSpec's challenge against the '321 patent.

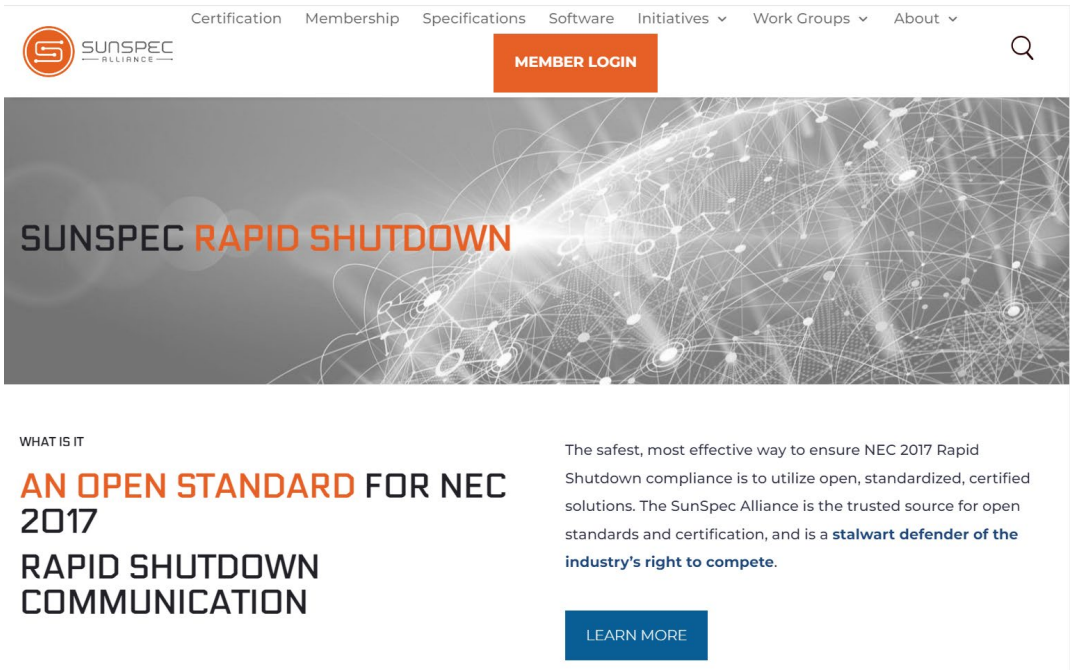
73. On information and belief, SunSpec sent out emails providing the content of the January 30, 2023 press release to all of its members.

74. On information and belief, SunSpec also made announcements on social media pushing the content of the January 30, 2023 press release to the public.

75. The January 30, 2023 press release and the communications that SunSpec sent to its members do not suggest that a license from Tigo for the '321 patent is needed to adhere to the SunSpec

RSD Specifications. Instead, the January 30 press release and the communications that SunSpec sent to its members misleadingly implied that SunSpec succeeded in invalidating Tigo's patent claims related to the SunSpec RSD Specifications, thereby incorrectly suggesting that a license to Tigo's '321 patent is not needed to use the SunSpec RSD Specifications.

76. SunSpec's primary website page for its rapid-shutdown standard (https://sunspec.org/sunspec-rapid-shutdown-initiative/) continues to promote SunSpec's IPR challenge against Tigo's '321 patent and the fact that the Patent Office instituted *inter partes* review based on SunSpec's petition, by providing a link to its February 15, 2022 press release (https://sunspec.org/inter-partes-review/, Exhibit 9) in the first paragraph of that website page, through the bolded text "stalwart defender of the industry's right to compete:"



(https://sunspec.org/sunspec-rapid-shutdown-initiative/). As described above, the February 15, 2022 press release states that "SunSpec strongly disagrees with Tigo that any products practicing the Rapid Shutdown Specification infringe any valid Tigo patents" and that it filed the IPR in order to support its position. (Exhibit 9.)

77. SunSpec's primary website page for its rapid-shutdown standard (https://sunspec.org/sunspec-rapid-shutdown-initiative/) does not acknowledge that the Patent Office decided not to invalidate any claims in SunSpec's challenge against the '321 patent. Instead, SunSpec's website misleadingly

implies that a license to Tigo's '321 patent is not needed because SunSpec, as a "stalwart defender of the industry's right to compete," challenged the validity of Tigo's patent.

78. Thus, even after SunSpec knew that the Patent Office had rejected its invalidity positions by holding that none of the claims that SunSpec challenged in Tigo's '321 patent were unpatentable, SunSpec continued to use its website to promote the position that products using the SunSpec RSD Specifications do not infringe "any valid Tigo patents." This incorrectly suggests that a license to Tigo's '321 patent is not needed to use the SunSpec RSD Specifications.

D. SunSpec Is Intentionally Inducing Infringement Of Tigo's '321 Patent

79. As described above, SunSpec has had knowledge of the '321 patent since at least October 2017 when it was informed by Tigo that the '321 patent was necessary to the SunSpec RSD Specifications.

80. As described above, SunSpec has also had knowledge since at least October 2017 that any solar system that uses the SunSpec RSD Specifications infringes Tigo's '321 patent.

81. Despite knowing that a license to Tigo's '321 patent is required to use the SunSpec RSD Specifications, and despite knowing that the Patent Office rejected its IPR challenge to the validity of Tigo's '321 patent, SunSpec has actively, knowingly, and intentionally induced the public to use the SunSpec RSD Specifications and has incorrectly suggested that a license to Tigo's '321 patent is not needed. SunSpec specifically intends and encourages members of the public—including solar system installers, solar system customers, and SunSpec members—to make, use, sell, and offer for sale solar systems that comply with the SunSpec RSD Specifications, despite knowing that any solar system that complies with the SunSpec RSD Specifications infringes Tigo's '321 patent.

1. Example 1: The Solectric System Offer

82. In July 2023 Solectric—a California-licensed solar system installer based in Sacramento—offered to install a 4.00kW solar system that complies with the SunSpec RSD Specification for $17,280 (the "Solectric System Offer"). The Solectric System Offer is shown in Exhibit 19.

83. The Solectric System Offer includes ten 400W solar panels described in Exhibit 19 as "Q PEAK DUO BLK ML-G10 400." The data sheet for these solar panels is attached as Exhibit 20.

84. The Solectric System Offer includes a SMA inverter described in Exhibit 19 as "SMA So

ar Techno ogy AG Sunny Boy 5 0-US 240V" (*sic*). The data sheet for this SMA inverter—Sunny Boy 5.0-US 240V—is attached as Exhibit 13. The Sunny Boy 5.0-US 240V inverter is certified as compliant with the SunSpec RSD Specifications. Its datasheet (Exhibit 13) includes the SunSpec rapid shutdown certification logo. The SMA webpage for the Sunny Boy 5.0-US 240V inverter is https://www.sma-america.com/products/solarinverters/sunny-boy-30-us-41-77-us-41. A copy is attached as Exhibit 21. The webpage reiterates that the inverter is certified as compliant with the SunSpec RSD Specifications and states that "SMA's SunSpec certified rapid shutdown device offers the fastest, most reliable, and safest method for complying with NEC 2017 690.12." (Exhibit 21.)

85. The Solectric System Offer includes rapid shutdown devices described in Exhibit 19 as "SMA SunSpec Rap d Shutdown Dev ce" (*sic*). The only SMA rapid shutdown device currently available is the JMS-F, as shown for example in Exhibit 23, a copy of https://www.sma-america.com/service-support/downloads with the "Category" option "SunSpec Certified Rapid Shutdown Technology" selected. The datasheet for SMA's JMS-F device that is available at https://files.sma.de/downloads/SMASunSpecRSD-DS-en-21.pdf is attached as Exhibit 24; an earlier version of the datasheet for SMA's JMS-F device is attached as Exhibit 15. The manual for SMA's JMS-F device that is available at https://files.sma.de/downloads/JMS-F-Installation-Manual-en-20230606.pdf is attached as Exhibit 25; an earlier version of that manual is attached as Exhibit 12.

86. The Solectric System Offer directly infringes claims 1, 12, and 13 of Tigo's '321 patent for the reasons stated above because it complies with the SunSpec RSD Specifications. For the system to be installed legally in the United States, it must comply with the National Electric Code, and to do so the offered system must comply with the SunSpec RSD Specifications. Additionally, the Solectric System Offer directly infringes claims 1, 12, and 13 of Tigo's '321 patent for the reasons stated below in Section F ("SunSpec Is Intentionally Inducing Contributory Infringement Of Tigo's '321 Patent By SunSpec Members Such As SMA").

2. Example 2: The United Solar Electric System Offer

87. In July 2023 United Solar Electric—a California-licensed solar system installer based in Brentwood—offered to install a 6.4kW solar system that complies with the SunSpec RSD Specification for $23,400 (the "United Solar Electric System Offer"). The United Solar Electric System Offer is shown

in Exhibit 26.

88. The United Solar Electric System Offer includes sixteen 400W solar panels described in Exhibit 26 as "Solaria Corporation – Power X-400R (400 Watts)." The data sheet for these solar panels is attached as Exhibit 27.

89. The United Solar Electric System Offer includes a SMA inverter described in Exhibit 19 as "SMA Solar Technology - SB 6000-US-11(240V)." The data sheet for this SMA inverter—Sunny Boy 6.0-US 240V—is attached as Exhibit 13. The Sunny Boy 6.0-US 240V inverter is certified as compliant with the SunSpec RSD Specifications. Its datasheet (Exhibit 13) includes the SunSpec rapid shutdown certification logo. The SMA webpage for the Sunny Boy 6.0-US 240V inverter is https://www.sma-america.com/products/solarinverters/sunny-boy-30-us-41-77-us-41. A copy is attached as Exhibit 21. The webpage reiterates that the inverter is certified as compliant with the SunSpec RSD Specifications and states that "SMA's SunSpec certified rapid shutdown device offers the fastest, most reliable, and safest method for complying with NEC 2017 690.12." (Exhibit 21.)

90. The United Solar Electric System Offer includes rapid shutdown devices described in Exhibit 19 as "SMA RSD (Rapid Shutdown Device)." The only SMA rapid shutdown device currently available is the JMS-F, as shown for example in Exhibit 23, a copy of https://www.sma-america.com/service-support/downloads with the "Category" option "SunSpec Certified Rapid Shutdown Technology" selected. The datasheet for SMA's JMS-F device that is available at https://files.sma.de/downloads/ SMASunSpecRSD-DS-en-21.pdf is attached as Exhibit 24; an earlier version of the datasheet for SMA's JMS-F device is attached as Exhibit 15. The manual for SMA's JMS-F device that is available at https://files.sma.de/downloads/JMS-F-Installation-Manual-en-20230606.pdf is attached as Exhibit 25; an earlier version of that manual is attached as Exhibit 12.

91. The United Solar Electric System Offer directly infringes claims 1, 12, and 13 of Tigo's '321 patent for the reasons stated above because it complies with the SunSpec RSD Specifications. For the system to be installed legally in the United States, it must comply with the National Electric Code, and to do so the offered system must comply with the SunSpec RSD Specifications. Additionally, the Solectric System Offer directly infringes claims 1, 12, and 13 of Tigo's '321 patent for the reasons stated below in Section F ("SunSpec Is Intentionally Inducing Contributory Infringement Of Tigo's '321 Patent

By SunSpec Members Such As SMA").

3. Example 3: SMA Testing In The United States

92. On information and belief, SMA has tested solar systems in the United States that comply with the SunSpec RSD Specifications (the "SMA Test System(s)").

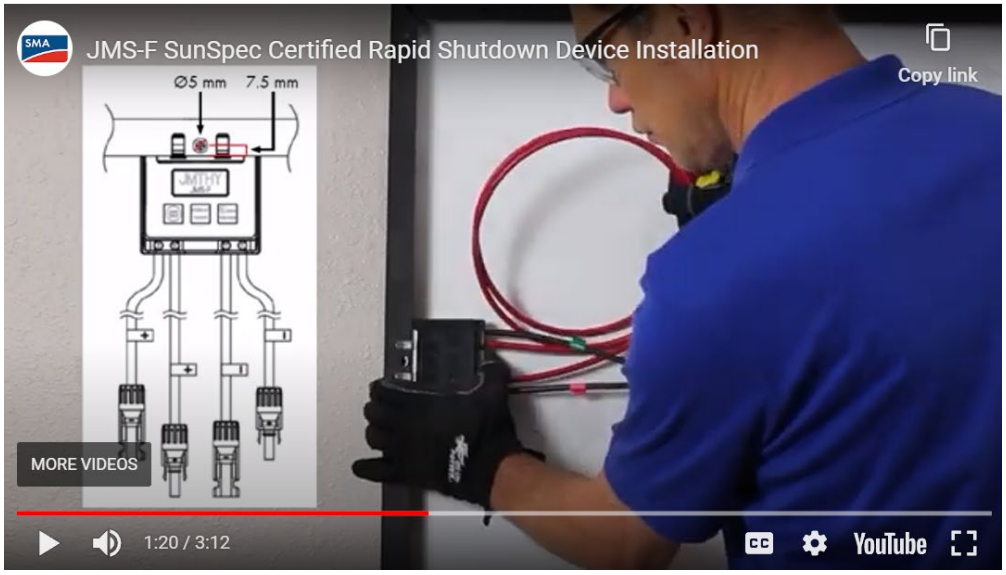
93. On information and belief, SMA maintains the website www.sma-sunny.com. A copy of a March 3, 2021 blog post from that website (https://www.sma-sunny.com/us/jms-f-sunspec-certified-rapid-shutdown-device-installation/) is attached as Exhibit 28. The blog post contains a link to a video titled "JMS-F SunSpec Certified Rapid Shutdown Device Installation" that is available at https://www.youtube.com/ watch?v=ODxNwioxRm0.

94. On information and belief, the narrator in the video is Mr. Michael Mahon, a Technical Trainer at SMA America who is based at SMA's facility in Rocklin, California. Mr. Mahon states in the video that SMA has tested the SMA JMS-F rapid shutdown device with the Sunny Boy US-41 inverter line as well as the Core 1 US-41 inverter line, both of which are SunSpec certified. The Sunny Boy US-41 inverter line is described in Exhibits 13 and 21 and includes the SMA inverters described above in Example 1 and Example 2. The Core 1 US-41 inverter line is described in its datasheet, Exhibit 29.

95. Mr. Mahon states in the video that "every module in the array must be equipped with the JMS-F rapid shutdown device" to meet the requirements of the 2017 National Electric Code.

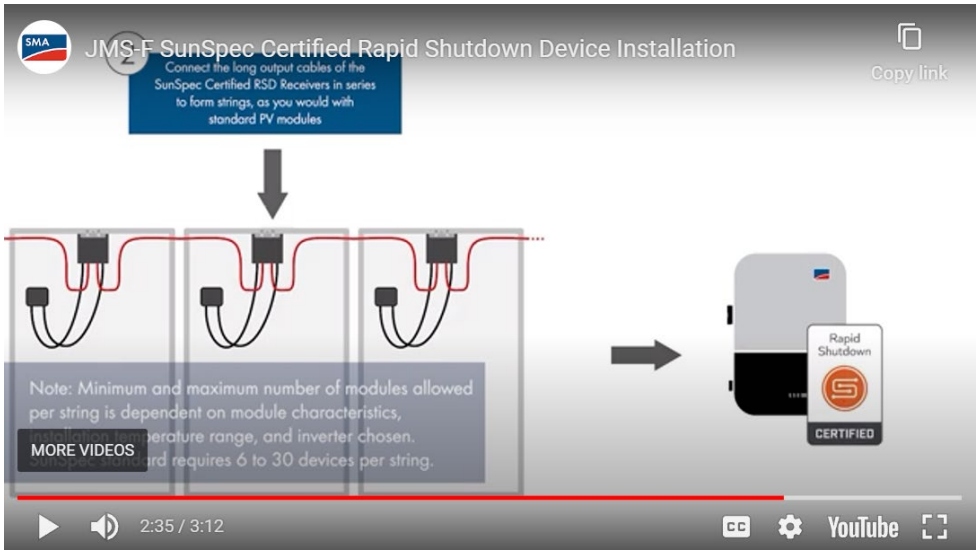
96. The video demonstrates how to mount the SMA JMS-F rapid shutdown device on a solar panel. The narrator states that the SMA JMS-F rapid shutdown device "slides onto the module frame and

the included screw and washer are used to secure the device."



97. The video states that SMA's JMS-F rapid shutdown device will remain in shutdown mode until it receives the "keep alive signal" from the SunSpec transmitter built into the inverter.

98. The video shows how a solar system is assembled in compliance with the SunSpec RSD Specifications, including the requirement of 6-30 solar panels per string connected to a SMA inverter containing a SunSpec-certified rapid-shutdown transmitter:



99. The SMA Test System(s) directly infringe claims 1, 12, and 13 of Tigo's '321 patent for the reasons stated above because they comply with the SunSpec RSD Specifications. Additionally, the Solectric System Offer directly infringes claims 1, 12, and 13 of Tigo's '321 patent for the reasons stated below in Section F ("SunSpec Is Intentionally Inducing Contributory Infringement Of Tigo's '321 Patent

By SunSpec Members Such As SMA").

100. Each of the three examples above show that SunSpec has successfully induced members of the public—including solar system installers, solar system customers, and SMA, a SunSpec member—to make, use, sell and/or offer for sale solar systems that comply with the SunSpec RSD Specifications, despite knowing that any solar system that complies with the SunSpec RSD Specifications infringes at least claims 1, 12, and 13 of Tigo's '321 patent.

101. The full extent of direct infringement induced by SunSpec is not presently known to Tigo. On information and belief, SunSpec has induced other individuals or entities beyond the three examples above to make, use, sell, offer for sale, or import solar systems that comply with the SunSpec RSD Specifications products and thus infringe claims 1, 12, and 13 of Tigo's '321 patent.

E. SunSpec's Testing And Certification Business Infringes Tigo's '321 Patent

102. On information and belief, SunSpec provides testing and certification for the SunSpec RSD Specifications that allows SunSpec members to obtain SunSpec certifications verifying that their products adhere to the SunSpec RSD Specifications. To do so, SunSpec establishes relationships with "SunSpec Authorized Test Laboratories" that operate in the United States, including Intertek US, Kyrio, CSA Group, TUV Rheinland US, TÜV SÜD, and Underwriters Laboratories (UL). When a SunSpec member seeks to certify a product, the member pays a fee to SunSpec, and one or more of these SunSpec Authorized Test Laboratories performs the tests required by the Test Specification under SunSpec's direction and control. A report on the testing is then provided to SunSpec, which SunSpec uses to determine whether to certify the member's device as compliant with the SunSpec RSD Specifications.

103. SunSpec is directly infringing at least claims 1, 12, and 13 of the '321 patent, literally and under the doctrine of equivalents, when SunSpec Authorized Test Laboratories perform the tests required by the Test Specification on SunSpec members' products so that SunSpec can determine whether or not to certify those products as compliant with the SunSpec RSD Specifications. SunSpec directs and controls the SunSpec Authorized Test Laboratories to perform the tests required by the Test Specification on SunSpec members' products so that SunSpec can determine whether or not to certify those products. Additionally, by operating its certification business SunSpec is putting into service the invention of claims 1, 12, and 13 of Tigo's '321 patent, controlling the system as a whole through the requirements of the

SunSpec RSD Specifications, and obtaining a benefit by charging membership and certification fees to its members. Thus, SunSpec is using every element of the solar system of claims 1, 12, and 13 of Tigo's '321 patent by putting every element collectively into service in order to certify products as compliant with the SunSpec RSD Specifications and collect fees for doing so.

104. In the alternative, SunSpec is actively inducing SunSpec Authorized Test Laboratories to directly infringe at least claims 1 and 12 of the '321 patent by inducing SunSpec Authorized Test Laboratories to perform the tests required by the Test Specification, which involve making and using a system that complies with the SunSpec RSD Specifications, despite knowing that doing so infringes at least claims 1 and 12 of Tigo's '321 patent literally and/or under the doctrine of equivalents.

105. The testing performed by a SunSpec Authorized Test Laboratory pursuant to the Test Specification includes using a system in which a watchdog unit is coupled between a solar module or the equivalent of a solar module and a power bus, where the power bus is configured to connect a plurality of solar modules to an inverter and a transmitter.

106. Figure 4.1 of the Test Specification has a box labeled "power supply or PV module" connected to "Receiver B":

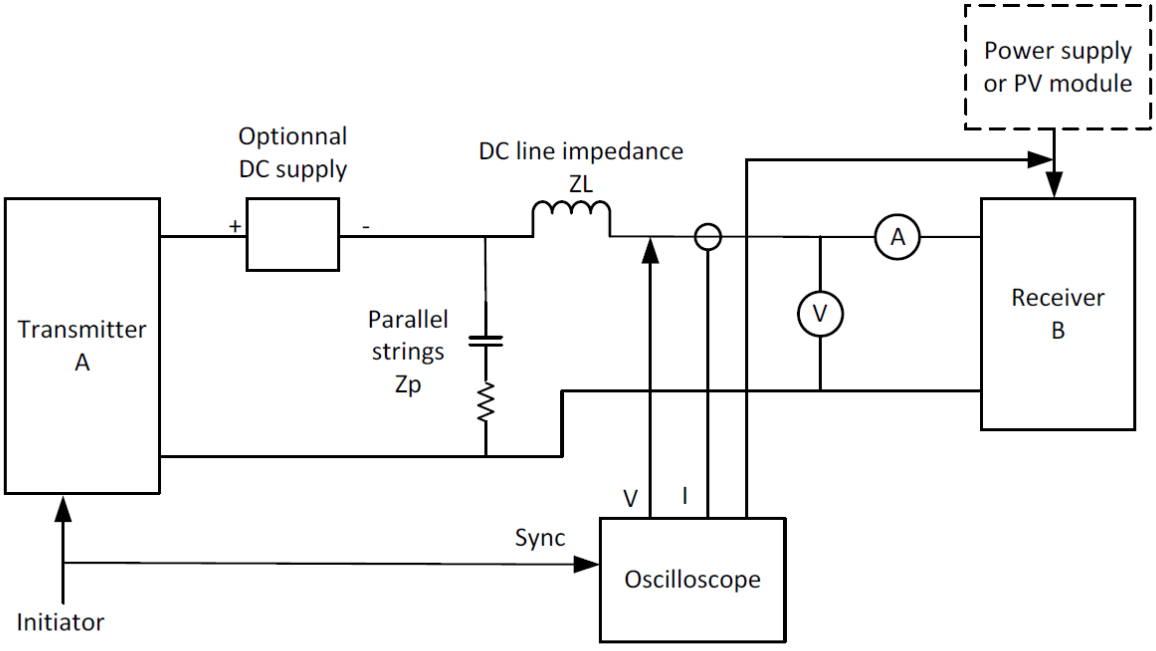


Figure 4.1: Principle of interoperability test framework

(Exhibit 3 at 23.)

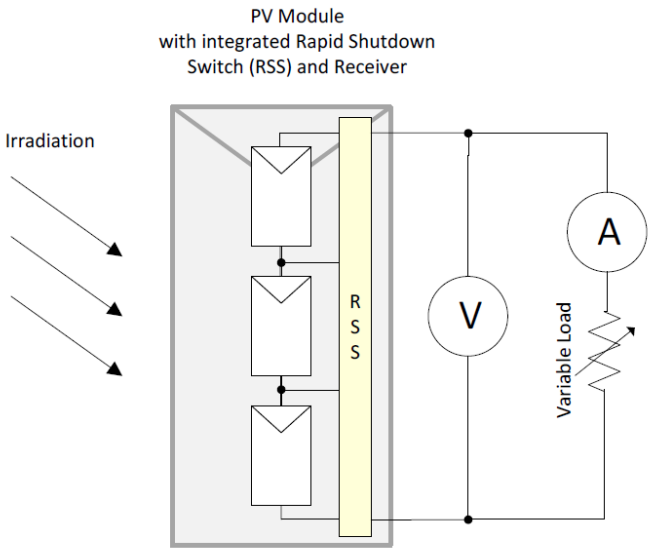
107. The Test Specification defines "test setup 1" for a "shutdown output voltage test" as using a PV module that is "illuminated with enough light:"

> **3.2.6.Test setup 1 – powered by PV module**
>
> The unit is tested when mounted into the junction box of a PV module and connected to the cell strings of the module in a way specified by the manufacturer. The module shall be illuminated with enough light to conduct the tests. The irradiation shall be stable during the measurement. At the output port a variable load is connected.

(Exhibit 3 at 22.) The Test Specification also explains that when a "receiver is integrated inside a PV module, means shall be provided to give power to the receiver." (Exhibit 3 at 22.)

108. The Test Specification defines a "start process test" that is part of an "interoperability test of two different devices," which requires that when "the transmitter sends a keep alive signal on the DC power line, the receiver demodulates the signal and connects the PV module on the string." (Exhibit 3 at 21(emphasis added).)

109. Figure 3.7 of the Test Specification also shows a solar module:



(Exhibit 3 at 26.)

110. In a table titled "Interoperability test description" the Test Specification identifies the "Pre-test conditions" as including that "the receiver is connected to a PV module with sun or is connected to a DC supply simulating a PV module." (Exhibit 3 at 24.) A "a DC supply simulating a PV module" is equivalent to a solar module in this context, i.e. testing a rapid shutdown device to ensure that it will perform as designed by shutting down the solar module when the RSD stops receives a permission-to-operate signal from the transmitter. A "DC supply simulating a PV module" is insubstantially different

from a solar module because it is designed and intended to simulate a solar module and because the standard allows it to be used interchangeably with a solar module in this context. Additionally, the SunSpec RSD Specifications show that it is performing the same function (providing power to the RSD device) in the same way (by creating a voltage across the input terminals of the RSD device), to achieve the same result (testing a rapid-shutdown device to ensure that it will perform as designed by shutting down the RSD's power source when the RSD stops receiving a permission-to-operate signal from the transmitter).

111. The Test Specification includes the following figures, which show a watchdog unit (in blue, labeled RSD) that is coupled between the equivalent of a solar module and a power bus, where the power bus is configured to connect a plurality of solar modules to an inverter and a transmitter (the components on the right labeled in one figure as "SunSpec signal pattern generator").

An RSD with multiple inputs shall be tested with identical supply circuits connected to its inputs. Figure 3.2 depicts the example of the test setup with a multi-module RSD with two modules.

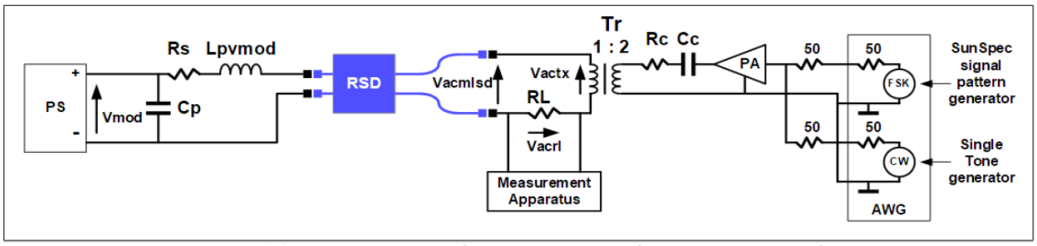


Figure 3.1: Receiver test configuration in case of a single-module RSD

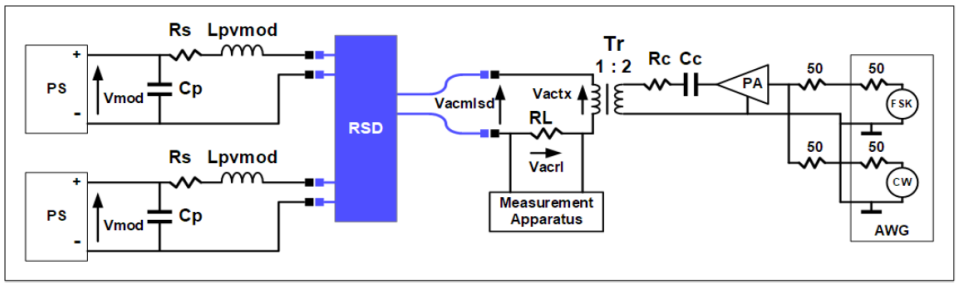


Figure 3.2: Receiver test configuration in case of a multi-module RSD

(Exhibit 3 at 7-8.)

112. The components in these Figures 3.1 and 3.2 that are drawn in black on the left of the blue "RSD" and that are connected to the RSD inputs are described in the Test Specification as "equipment to simulate the voltage of a PV module." These components are equivalent to a solar module in this context, i.e. testing a rapid-shutdown device to ensure that it will perform as designed by shutting down the solar module when the RSD stops receives a permission-to-operate signal from the transmitter. They are

insubstantially different from a solar module because they are designed and intended to simulate a solar module. Additionally, the SunSpec RSD Specifications show that they are performing the same function as a solar module (providing electric power to the RSD device) in the same way (by creating a voltage across the input terminals of the RSD device), to achieve the same result (testing a rapid-shutdown device to ensure that it will perform as designed by shutting down the RSD's power source when the RSD stops receiving a permission-to-operate signal from the transmitter).

113. The testing performed by a SunSpec Authorized Test Laboratory pursuant to the Test Specification includes using a local controller in the watchdog unit that is configured to monitor a communication (the SunSpec signal) from a central controller (the SunSpec signal pattern generator) that is remote from the watchdog unit and the solar module or its equivalent and determine whether the communication has been interrupted for a time period longer than a predetermined number of allowed skips as discussed above.

114. The testing performed by a SunSpec Authorized Test Laboratory pursuant to the Test Specification includes using at least one switch configured to disconnect the solar module or its equivalent from the power bus (cause a rapid shutdown) in response to a determination by the location controller that the communication (the SunSpec signal) from the central controller (transmitter / SunSpec signal pattern generator) has been interrupted for a time period longer than the predetermined number of allowed skips as discussed above.

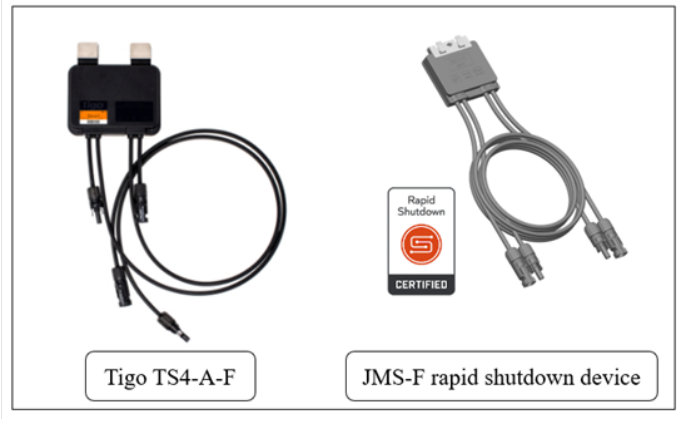
115. The testing performed by a SunSpec Authorized Test Laboratory pursuant to the Test Specification includes configuring the solar module or its equivalent to connect to the power bus when the communication is not interrupted as discussed above and as shown for example by Test Specification's requirement that when "the transmitter sends a keep alive signal on the DC power line, the receiver demodulates the signal and connects the PV module on the string." (Exhibit 3 at 21.)

F. SunSpec Is Intentionally Inducing Contributory Infringement Of Tigo's '321 Patent By SunSpec Members Such As SMA

116. On information and belief, SMA's JMS-F rapid shutdown device's is a copy of Tigo's TS4-A-F product.

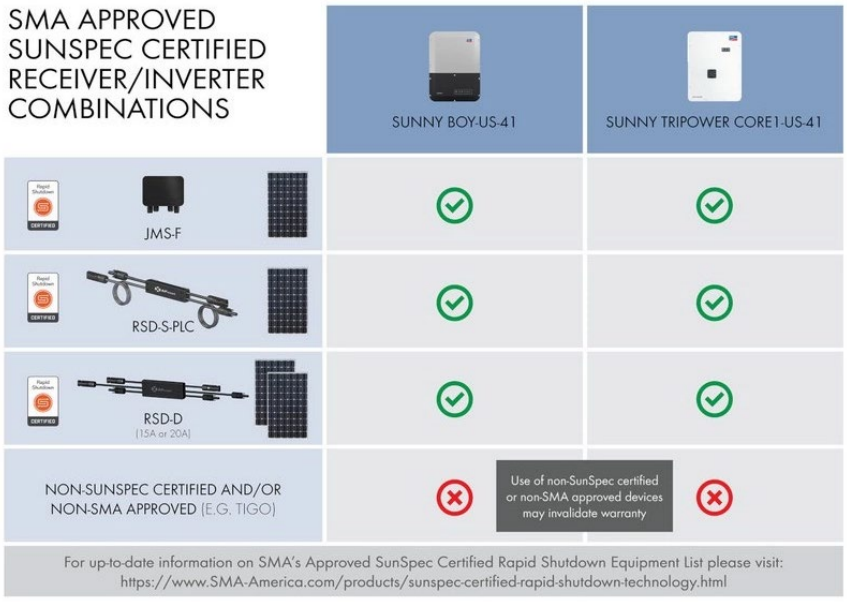
117. Like Tigo's TS4-A-F product, the JMS-F is a module-level rapid shutdown unit that is

attached to individual photovoltaic panels:



See, e.g., https://www.sma-america.com/products/sunspec-certified-rapid-shutdown-technology/jms-f-sunspec-rapid-shutdown-device.html.

118. SMA's SunSpec-certified inverters, including specifically Sunny Boy US-41 inverter line (Exhibit 13) and the Tripower Core 1 US-41 inverter line (Exhibit 29) employ "SunSpec rapid shutdown technology" and are specifically designed, intended, and promoted to be used in combination with SMA's JMS-F. This is shown for example by (i) SMA's JMS-F datasheets, Exhibit 15 and 24; (ii) SMA's June 9, 2021 blog post, titled "Top 4 Benefits of SunSpec Rapid Shutdown," attached as Exhibit 22; (iii) SMA's "Power+ Solution" brochure, which is attached as Exhibit 30; and (iv) the SMA webpage for the Sunny Boy US-41 and Tripower Core 1 US-41 inverter lines:



(Exhibit 21 at 4.)

119. Like the Tigo RSS Transmitter, the SunSpec-certified SMA inverters described above provide a watchdog signal (the SunSpec keep-alive signal) to a rapid shutdown device (the JMS-F), for rapid shutdown along the powerline to enable a photovoltaic system that complies with NEC § 690.12. For example:

- Exhibits 12 and 25 (JMS-F Installation Manuals) at 5 ("The signal is transmitted by the inverter with built-in transmitter function through the DC bus. . . . When an emergency situation occurs, the AC power can be turned off by switching the AC breaker in the cabinet, so that the inverter with built in transmitter function stops sending signals, and the JMS-F will shutdown power output . . ."), 10-12;

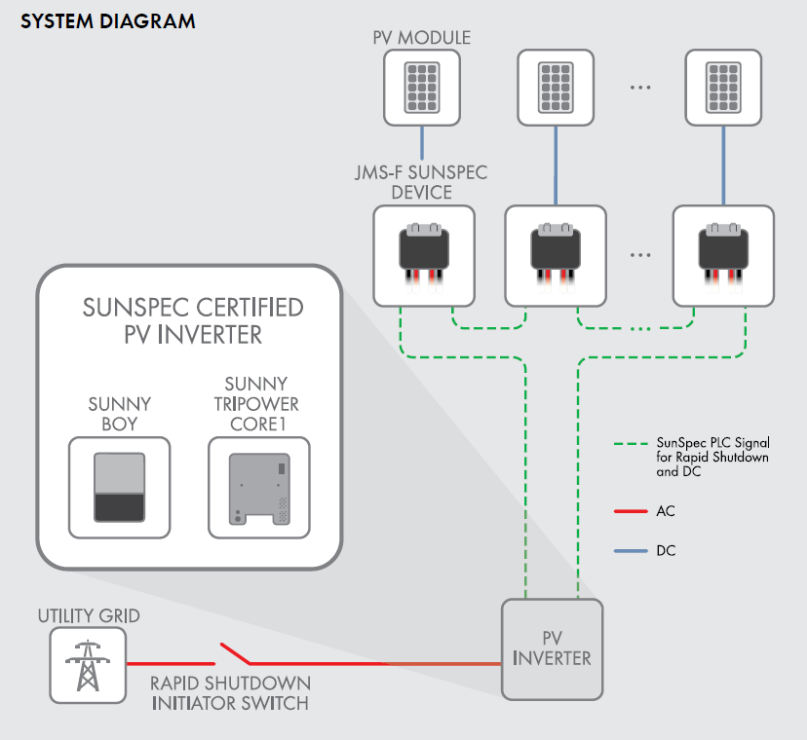
- Exhibit 13 (Sunny Boy US-41 datasheet) at 3 ("The SMA Energy System Home combines legendary SMA inverter performance and SunSpec certified shutdown devices in one cost-effective, comprehensive package . . . . This rapid shutdown solution fulfills UL 1741, NEC 2014, and NEC 2017 requirements and is certified to the power line-based SunSpec Rapid Shutdown communication signal over DC wires, making it the most simple and cost-effective rapid shutdown solution on the market.");

- Exhibit 14 (Sunny Boy US-41 Installation Manual) at 20 ("A complete PV Rapid Shutdown System consists of the inverter, PV array disconnect switches, and a Rapid Shutdown initiation device. The Rapid Shutdown initiation device serves to initiate a rapid shutdown. The PV Rapid Shutdown System must limit the DC conductors to < 30 V within 30 seconds.").

120. On information and belief, SMA has made, used, sold, offered to sell, imported, installed and has had installed the SMA JMS-F in combination with the Sunny Boy US-41 and Tripower Core 1 US-41 inverter lines.

121. When a solar system using (i) a SunSpec-certified inverter from SMA's Sunny Boy US-41 or Tripower Core 1 US-41 inverter lines and (ii) SunSpec-certified SMA JMS-F devices is installed, used, sold, or offered in the United States (an "SMA-Based Solar System") the SunSpec-certified SMA components are a material part of the solar system of claims 1, 12, and 13 of Tigo's '321 Patent and are not staple articles or commodity of commerce suitable for substantial noninfringing use. In the United States these SunSpec-certified components must be installed in accordance with the infringing SunSpec RSD Specifications in order to comply with the National Electric Code, and they have no substantial use other than in an infringing solar system that uses the SunSpec RSD Specifications. They are a material part of the solar system of claims 1, 12, and 13 of Tigo's '321 Patent, for example because they implement the invention described in Tigo's '321 Patent.

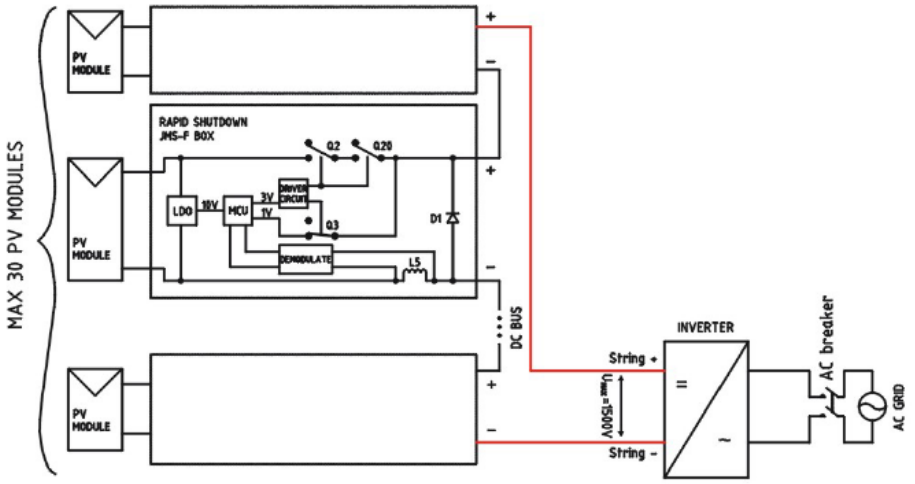
122. In a SMA-Based Solar System, the SMA JMS-F device is a watchdog unit coupled between a solar module (the PV module shown below) and a power bus (the DC lines shown in green below), where the power bus configured to connect a plurality of solar modules to an inverter (the SunSpec Certified PV Inverter shown below):



(Exhibit 15 at 2; Exhibit 24 at 2.)

123. The SMA JMS-F comprises a local controller configured to monitor a communication (the SunSpec keep-alive signal) from a central controller remote from the solar module (the SunSpec transmitter in a SunSpec-certified inverter from SMA's Sunny Boy US-41 or Tripower Core 1 US-41 inverter lines) and determine whether the communication has been interrupted for a time period longer than a predetermined number of allowed skips:

6. Initiating Rapid Shutdown



When the AC breaker is turned off, the inverter with built-in transmitter function stops sending the signal "permission-to-operate" through the DC bus. JMS-F does not receive the signal and waits for 10 seconds to enter the turn-off mode. Then the MOSFET Q3 is activated and the MOSFET Q2/Q20 is deactivated, the output voltage of JMS-F is 1 Volt, and the PV system is in the no-load state.

Rapid shutdown steps:

STEP1: Switch off the AC breaker on the AC side of the PV system.

STEP2: The inverter with built-in transmitter function stops sending signals, thus initiating rapid shutdown.

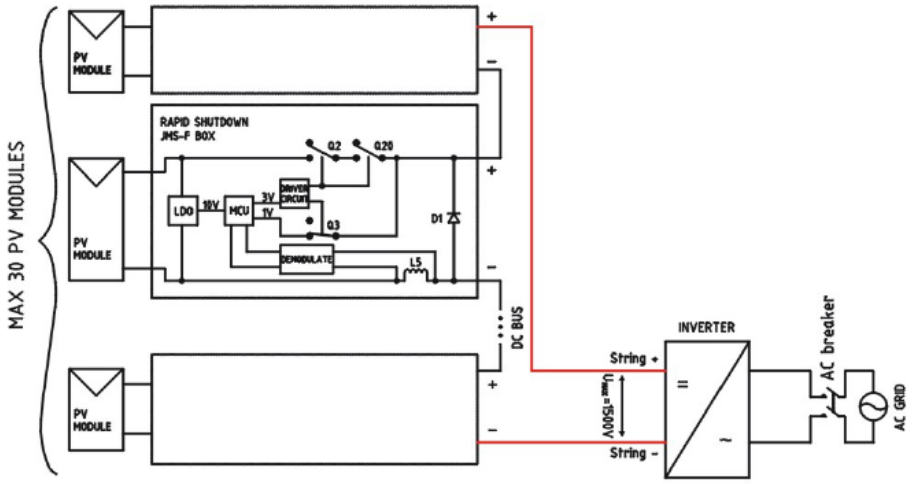
STEP3: Each JMS-F does not receive the signal then executing rapid shutdown, the output voltage of each JMS-F is 1 Volt.

STEP4: At the final stage the DC bus voltage of the PV system drops to below 30 Volts within 30 seconds.

(Exhibit 12, JMS-F Installation Manual at 11.)

124. The SMA JMS-F comprises at least one switch configured to disconnect the solar module from the power bus (e.g., cause a rapid shutdown) in response to a determination by the location controller that the communication (e.g., a signal such as a SunSpec signal) from the central controller (e.g., the SMA inverter) has been interrupted for a time period longer than the predetermined number of allowed skips:

6. Initiating Rapid Shutdown



When the AC breaker is turned off, the inverter with built-in transmitter function stops sending the signal "permission-to-operate" through the DC bus. JMS-F does not receive the signal and waits for 10 seconds to enter the turn-off mode. Then the MOSFET Q3 is activated and the MOSFET Q2/Q20 is deactivated, the output voltage of JMS-F is 1 Volt, and the PV system is in the no-load state.

Rapid shutdown steps:

STEP1: Switch off the AC breaker on the AC side of the PV system.

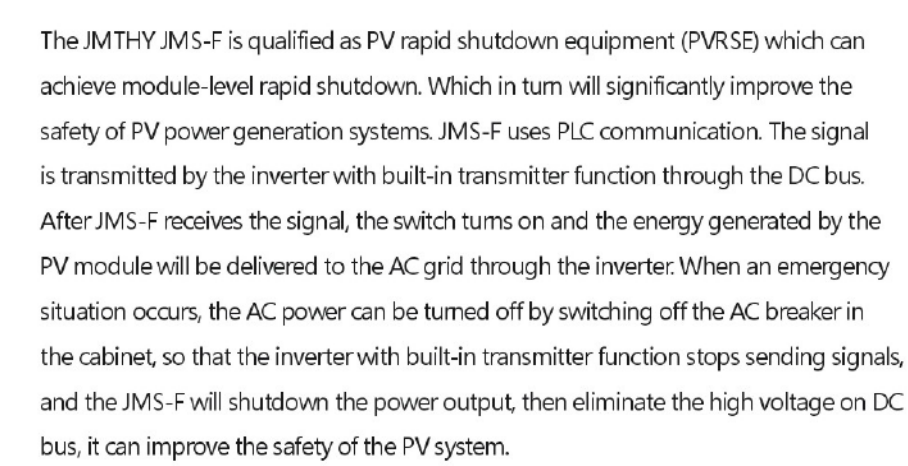
STEP2: The inverter with built-in transmitter function stops sending signals, thus initiating rapid shutdown.

STEP3: Each JMS-F does not receive the signal then executing rapid shutdown, the output voltage of each JMS-F is 1 Volt.

STEP4: At the final stage the DC bus voltage of the PV system drops to below 30 Volts within 30 seconds.

(Exhibit 12, JMS-F Installation Manual at 11.)

125. In a SMA-Based Solar System, the SMA JMS-F device is configured to connect the solar module to the power bus when the communication is not interrupted:



2. Function Description

The JMTHY JMS-F is qualified as PV rapid shutdown equipment (PVRSE) which can achieve module-level rapid shutdown. Which in turn will significantly improve the safety of PV power generation systems. JMS-F uses PLC communication. The signal is transmitted by the inverter with built-in transmitter function through the DC bus. After JMS-F receives the signal, the switch turns on and the energy generated by the PV module will be delivered to the AC grid through the inverter. When an emergency situation occurs, the AC power can be turned off by switching off the AC breaker in the cabinet, so that the inverter with built-in transmitter function stops sending signals, and the JMS-F will shutdown the power output, then eliminate the high voltage on DC bus, it can improve the safety of the PV system.

(Exhibit 12, JMS-F Installation Manual at 5.)

126. As described above, SunSpec has had knowledge of the '321 patent since at least October 2017 when it was informed by Tigo that the '321 patent was necessary to the SunSpec RSD Specifications.

127. As described above, SunSpec has also had knowledge since at least October 2017 that any solar system that uses the SunSpec RSD Specifications infringes Tigo's '321 patent.

128. Despite this knowledge, as described above SunSpec has actively, knowingly, and intentionally induced SunSpec members such as SMA to make, use, sell, and/or offer for sale products that are certified under the SunSpec RSD Specifications as transmitters and receivers. These SunSpec-certified products have no substantial use except in a solar system that uses the SunSpec RSD Specifications and thus infringe claims 1, 12, and 13 of Tigo's '321 Patent. These SunSpec-certified products are a material part of the solar system of claims 1, 12, and 13 of Tigo's '321 Patent for example because they implement the invention described in Tigo's '321 Patent. (*E.g.* Exhibit 1 at Abstract, 1:43-2:12, 7:56-8:4.) In so doing, SunSpec has incorrectly suggested to SunSpec members such as SMA that a license to Tigo's '321 patent is not needed.

COUNT I

(INFRINGEMENT OF U.S. PATENT NO. 8,933,321)

129. Tigo repeats and realleges each of the paragraphs above as if fully set forth herein.

130. On January 13, 2015, the United States Patent and Trademark Office duly and legally

issued the '321 patent. Tigo is the owner and assignee of all substantial rights in the '321 patent, including the right to enforce the '321 patent.

131. Each individual claim in the '321 patent recites an independent invention. No individual claim is representative of all claims in the '321 patent.

132. All solar systems that comply with the SunSpec RSD Specifications infringe least claims 1, 12, and 13 Tigo's '321 patent.

133. Despite knowing that all solar systems that comply with the SunSpec RSD Specifications infringe least claims 1, 12, and 13 Tigo's '321 patent, SunSpec is inducing infringement of those claims by encouraging members of the public—including solar system installers, solar system customers, and SunSpec members—to make, use, sell, and offer for sale solar systems that comply with the SunSpec RSD Specifications and thus directly infringe, and by incorrectly suggesting that a license to Tigo's '321 patent is not needed to make, use, sell, and offer for sale solar systems that comply with the SunSpec RSD Specifications.

134. SunSpec is directly infringing at least claims 1, 12, and 13 of the '321 patent, literally and under the doctrine of equivalents, when SunSpec Authorized Test Laboratories perform the tests required by the Test Specification on SunSpec members' products so that SunSpec can determine whether or not to certify those products as compliant with the SunSpec RSD Specifications. SunSpec directs and controls the SunSpec Authorized Test Laboratories to perform the tests required by the Test Specification on SunSpec members' products so that SunSpec can determine whether or not to certify those products. Additionally, by operating its certification business SunSpec is putting into service the invention of claims 1, 12, and 13 of Tigo's '321 patent, controlling the system as a whole through the requirements of the SunSpec RSD Specifications, and obtaining a benefit by charging membership and certification fees to its members. Thus, SunSpec is using every element of the solar system of claims 1, 12, and 13 of Tigo's '321 patent by putting every element collectively into service in order to certify products as compliant with the SunSpec RSD Specifications and collect fees for doing so.

135. In the alternative to the previous paragraph, SunSpec is actively inducing SunSpec Authorized Test Laboratories to directly infringe at least claims 1, 12, and 13 of Tigo's '321 patent by inducing SunSpec Authorized Test Laboratories to perform the tests required by the Test Specification,

which involve making and using a system that uses the SunSpec RSD Specifications, despite knowing that doing so infringes at least claims 1, 12, and 13 of Tigo's '321 patent literally and/or under the doctrine of equivalents.

136. Additionally, SunSpec has actively, knowingly, and intentionally induced SunSpec members such as SMA to make, use, sell, and/or offer for sale products that are certified under the SunSpec RSD Specifications as transmitters and receivers, that are a material part of the solar system of claims 1, 12, and 13 of Tigo's '321 Patent, and that are not staple articles or commodity of commerce suitable for substantial noninfringing use. These SunSpec-certified products have no substantial use except in a solar system that uses the SunSpec RSD Specifications and thus infringe claims 1, 12, and 13 of Tigo's '321 Patent. These SunSpec-certified products are a material part of the solar system of claims 1, 12, and 13 of Tigo's '321 Patent for example because they implement the invention described in Tigo's '321 Patent. (*E.g.* Exhibit 1 at Abstract, 1:43-2:12, 7:56-8:4.)

137. Tigo has suffered and continues to suffer damages as a result of SunSpec's infringement of the '321 patent in an amount to be determined at trial.

138. SunSpec's infringement of the '321 patent is causing irreparable harm for which Tigo has no adequate remedy at law unless SunSpec is enjoined by this Court. Under 35 U.S.C. § 283, Tigo is entitled to a permanent injunction against further infringement of the '321 patent.

139. SunSpec's infringement of the '321 patent is willful and deliberate. SunSpec has been on notice that solar systems that use the SunSpec RSD Specifications infringe, and SunSpec has continued to directly infringe, induce infringement, and induce contributory infringement as described above despite SunSpec's knowledge that all solar systems that use the SunSpec RSD Specifications infringe the '321 patent. SunSpec's conduct in inducing infringement is also egregious in light of its posturing and representations to its members regarding the validity of Tigo's patents, including the '321 patent, as described above. As SunSpec has no good faith belief that it does not infringe the '321 patent, its continued infringement is willful and deliberate, entitling Tigo to increased damages under 35 U.S.C. § 284 and to attorneys' fees and costs incurred in prosecuting this action under 35 U.S.C. § 285.

JURY DEMAND

140. Tigo hereby requests a trial by jury pursuant to Rule 38 of the Federal Rules of Civil

Procedure.

PRAYER FOR RELIEF

141. Tigo respectfully requests that the Court find in its favor and against SunSpec and that the Court grant Tigo the following relief:

a. A judgment that SunSpec has infringed Tigo's '321 patent as alleged herein;

b. A permanent injunction against SunSpec and their affiliates, subsidiaries, assignees, employees, agents or anyone acting in privity or concert with them from further infringement of the '321 patent, including without limitation enjoining the inducement of others to make, use, sell, or offer for sale products or systems that infringe any claim of the '321 patent without a license from Tigo, until the expiration of the '321 patent.

c. A judgment for an accounting of all damages, past and future, sustained by Tigo as a result of the acts of infringement by SunSpec;

d. A judgment and order requiring SunSpec to pay Tigo damages under 35 U.S.C. § 284, including up to treble damages as provided by 35 U.S.C. § 284, and any royalties determined to be appropriate;

e. A judgment and order requiring SunSpec to pay Tigo pre-judgment and post-judgment interest on the damages awarded;

f. A judgment and order finding this to be an exceptional case and requiring SunSpec to pay the costs of this action (including all disbursements) and attorneys' fees as provided by 35 U.S.C. § 285; and

g. Such other and further relief as the Court deems just and equitable.

Dated: July 18, 2023

Respectfully submitted,

/s/ Nicholas Brown

Nicholas A. Brown (CA Bar No. 198210)
Greenberg Traurig, LLP
101 Second St. Ste. 2200
San Francisco, CA 94105
Phone: (415) 655-1300
Fax: (415) 707-2010

Stephen M. Ullmer (CA Bar No. 277537)
Greenberg Traurig, LLP

1144 15th St. Ste. 3300
Denver, CO 80202
Phone: 303-685-6579
Fax: 303-572-6540